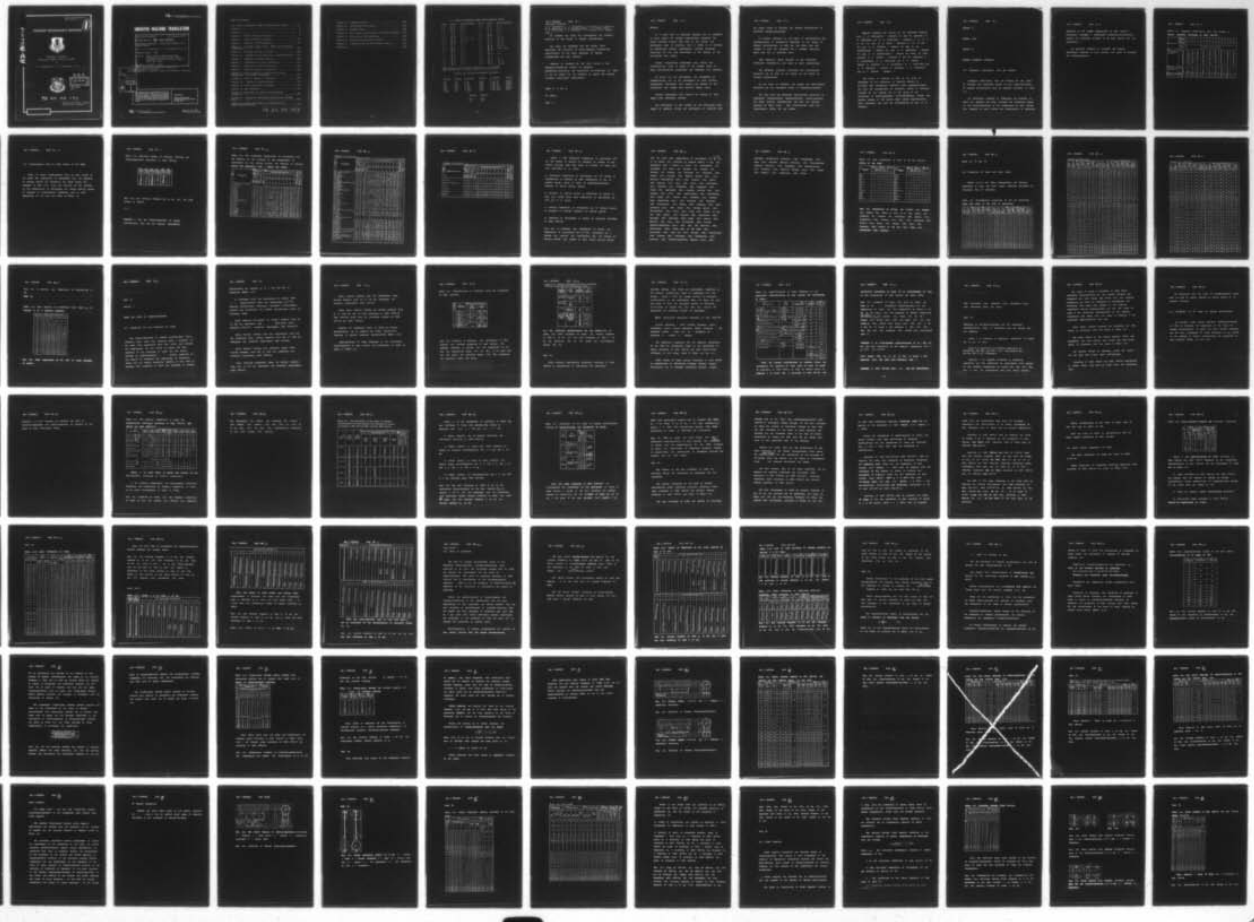
AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

1 OF 8
ADA
066413



AD-A066413

FTD-ID(RS)T-0094-78
Part 1 of 3

1

FOREIGN TECHNOLOGY DIVISION

DESIGNER'S HANDBOOK
INSTALLING THERMAL PIPELINE SYSTEMS

by

I. P. Aleksandrov, I. V. Belyaykina, et al.

DDC
RECEIVED
MAR 26 1979
D

78 09 08 051

Approved for public release;
distribution unlimited.

UNEDITED MACHINE TRANSLATION

FTD-ID(RS)T-0094-78 28 February 1978

MICROFICHE NR: FTD-78-C-000341

DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPE-LINE SYSTEMS

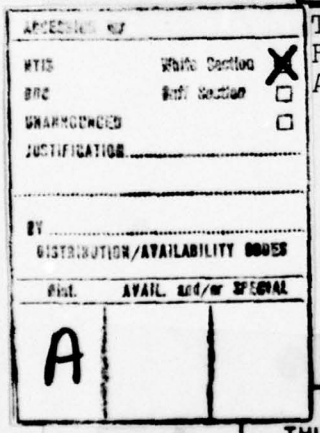
By: I. P. Aleksandrov, I. V. Belyaykina, et al.

English pages: 1199

Source: Spravochnik Proyektirovshchika, Prokladka Teplovykh Setey, Izd-vo Literatury po Stroitel'stvu, Moscow, 1965, pp. 1-359.

Country of origin: USSR

This document is a machine translation
Requester: FTD/TQTM
Approved for public release; distribution unlimited.



THIS TRANSLATION IS A RENDITION OF THE ORIGINAL FOREIGN TEXT WITHOUT ANY ANALYTICAL OR EDITORIAL COMMENT. STATEMENTS OR THEORIES ADVOCATED OR IMPLIED ARE THOSE OF THE SOURCE AND DO NOT NECESSARILY REFLECT THE POSITION OR OPINION OF THE FOREIGN TECHNOLOGY DIVISION.

PREPARED BY:

TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WP-AFB, OHIO.

Table of Contents

U.S. Board on Geographic Names Transliteration System..... iii

Preface..... 2

Section I..... 5

Chapter 1. General Reference Materials..... 5

Chapter 2. Tubes and Parts of Conduit..... 25

Chapter 3. Supports of Turboconductors..... 65

Chapter 4. Fittings, Flange Joints, Gasket and Corrugated Compensators..... 117

Chapter 5. Drainage Devices of Conduit..... 168

Section II. Diagrams and Calculations of Thermal Networks... 228

Chapter 6. Diagrams of Thermal Networks..... 228

Chapter 7. Determination of Heat Consumption..... 247

Chapter 8. Regulation of Heat Distribution..... 275

Chapter 9. Hydraulic Designs of Pipelines..... 338

Chapter 10. Stress Analysis of Pipeline and for the Compensation for Thermal Elongations..... 490

Chapter 11. Loads on Supports of Pipelines..... 694

Section III. Laying of Thermal Networks..... 731

Chapter 12. Overall Questions of Packing..... 731

Chapter 13. Heat Insulation 794

Chapter 14. Protection of Conduit from Electrical Corrosion..... 825

Section IV. Pumping and Preheating Installations, Thermal Point..... 974

Chapter 16. Quality and Quantity of Makeup Water of Water Thermal Networks..... 974

78 09 08 051

Chapter 17. Pumping Stations..... 995
Chapter 18. Preheating Insta lations..... 1031
Chapter 19. Thermal Point..... 1082
Section V. Heat Control and Automation of Thermal Networks 1107
Chapter 20. Heat Control and Automation..... 1107
Section VI. Technical and Economical Indices..... 1179
Chapter 21. Combined Technical and Economic Indices..... 1179
References..... 1199

U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

DESIGNER'S HANDBOOK

I. P. Aleksandrov, I. V. Belyaykina, A. M. Dalin, N. M. Zelikson, N. G. Ignat'yeva, D. Ye. Kalenkovitskiy, A. F. Mikhal'chenko, A. F. Nechushkin, A. A. Nikolayev, A. P. Safonov, M. G. Shpeyer.

Page 3.

In handbook are given the instructional and standard materials on the design of thermal grid/networks.

Are given the nomograms and the tables, which facilitate the execution of labor-consuming calculations, characteristic of the basic equipment of thermal grid/networks and heat sources.

Handbook is intended for the wide circle of the technical-engineering workers of planning, assembling-construction and operational organizations, and also it can be useful for the students of higher and average technical educational institutions.

Pages 4, 5 and 6.

No typing.

Page 7.

PREFACE.

At a rapid pace is developed industry and is conducted in large scales new housing construction, extruding the become obsolete housing fund both in the cities, and settlements rural of locality, that it leads to an increase in concentrated thermal requirements, creating favorable conditions for the wide development of the systems of the centralized heat supply.

Further considerable development will receive the thermofication, which is based on the thermal loads of large heat-capacitive enterprises and habitable city districs.

In cities and the settlements, not encompassed by thermofication, and in the settlements of rural locality considerable development will receive the systems of the centralized heat supply from district boiler rooms.

Certain development will receive the systems of heat supply from geothermal sources.

The development of the systems of the centralized heat supply in industry, cities and settlements is connected with

the large volume of building the thermal grid/networks of different designation/purpose.

In present handbook, on the basis of generalization and systematization of accumulated experiment on the design of thermal grid/networks, is made for the first time the attempt to give the necessary for a designer materials which will aid in practical work.

Some questions, which obtained in the literature sufficient illumination, are given in short presentation.

The assembled standard, calculated and instructional materials can be used on all stages of the design of thermal grid/networks.

As the basis of handbook, are placed the instructional materials and the systematic works of Teploelektroproyekt.

Are used also the published instructional materials of Lenproyekt, Mosinzhproyekt, Mosenergoproyekt, Promstroyproyekt, and other planning organizations, and also the standard material of Union value - SNIP [Construction norms and regulations], GOSTs, MN, and others.

Separate chapters are written by the following authors: eng. I. P. Aleksandrov - chapters 12 and 19; engineers I. V. Belyaykina and N. G. Ignat'yeva - chapters 2, 3, 4, 7, 8, 10, 11; eng. A. M. Dalin - chapters 6, 17, 18 and 20; eng. N. M. Zelikson - chapter 13; eng. D. Ye. Kalenkovitsky - chapter 14; eng. A. F. Nechushkin - chapter 15; eng. A. F. Mikhal'chenko - chapter 16; Cand. of tech. sciences A. P. Safonov - chapters 8 and 20; engineers I. V. Belyatskina, N. G. Ignat'yeva and M. G. Shpeyer - chapter 5; engineers I. V. Belyaykina, N. G. Ignat'yeva and A. A. Nikolayev - chapter 9; engineers I. V. Belyaykina and M. G. Shpeyer - chapter 1.

The review of handbook is made by the group of colleagues of the Laboratory of District Heating of All-Union Heat Engineering Institute under management/manual and with the collaboration of Professor, Doctor of Technical Sciences Ye. Ya. Sokolov and by the group of the specialists of Mosenergoproyekt, Giprokommunenergo, VNIIST, the heating systems of the Moscow Power System Administration under management and with the collaboration of eng. M. F. Filippov.

SECTION 1.

GENERAL PART.

CHAPTER 1.

GENERAL REFERENCE MATERIALS.

1.1. Pressures: conditional, test and working

Pressures conditional, test and working for the tubes of fittings and connecting pieces of the conduit/manifolds of thermal grid/networks must be accepted according to table 1.1.

By conditional pressure is understood the pressure to which are designed the tube, fittings and connecting pieces of the conduit/manifolds at the temperature of heat carrier 0°C, accepted as basic during the determination of operating

pressures at the higher temperatures of heat carrier. Conditional pressure P_y establishes communication/connection between the operating pressure $P_{раб}$ of heat carrier and its temperature.

As operating pressure is accepted the nominal operational pressure of heat carrier, for which is designed the conduit/manifold.

Table 1.1. Pressures conditional, test and workers in kg/cm². (surplus, according to GOST 356-59).

(1) Наименование	(2) Условные давления P_y	1	2.5	4	6	10	16	25	40	64
	(3) Пробные давления $P_{пр}$	2	4	6	9	15	24	38	60	96
	(4) Температура среды в °С	(5) Наибольшие рабочие давления $P_{раб}$								
(6) Трубы, арматура и соединительные части из углеродистой стали ($C \leqslant 0{,}3$)	(9) До 200	1	2,5	4	6	10	16	25	40	64
	225	1	2,4	3,8	6	9,5	15	24	38	60
	250	0,9	2,2	3,6	5,6	9	14	22	36	56
	275	0,9	2,1	3,4	5,3	8,5	13	21	34	53
	300	0,8	2	3,2	5	8	12,5	20	32	50
	325	0,8	1,9	3	4,8	7,5	12	19	30	48
	350	0,7	1,8	2,8	4,5	7	11	18	28	45
	375	0,7	1,7	2,6	4,2	6,7	10,5	17	26	42
	400	0,6	1,6	2,5	4	6,4	10	16	25	40
	410	0,6	1,5	2,4	3,8	6	9,5	15	24	38
	425	0,6	1,4	2,2	3,6	5,6	9	14	22	36
	430	0,5	1,3	2,1	3,4	5,3	8,5	13	21	34
	435	0,5	1,2	2	3,2	5	8	12,5	20	32
	440	0,5	1,2	1,9	3	4,8	7,5	12	19	30
	445	0,5	1,1	1,8	2,8	4,5	7	11	18	28
	450	—	1	1,7	2,6	4,2	6,7	10,5	17	26
(7) Арматура и соединительные части из чугунов (серого и ковкого)	(9) До 120	1	2,5	4	6	10	16	25	40	—
	200	1	2,5	3,6	5,5	9	15	23	36	—
	250	1	2	3,4	5	8	14	21	34	—
	300	1	2	3,2	5	8	13	20	32	—
	350*	0,8	1,9	3	4,5	7,5	12	18	30	—
	400*	0,7	1,6	2,8	4,2	7	10	16	28	—
(8) То же, из бронзы и латуни	(9) До 120	1	2,5	4	6	10	16	25	40	64
	200	1	2	3,2	5	8	13	20	32	—
	250	0,7	1,7	2,7	4	7	11	17	27	—

Notes: 1. Chain wheel designated temperatures only for malleable cast iron.

2. To conduit/manifolds in assembled form GOST 356-59, it is not spread.

3. Operating pressures for intermediate values of temperature of medium are determined by linear interpolation.

4. During determination of step/stage of conditional pressure, is allow/assumed excess of actual operating pressure within limits to 5o/o above that which was indicated for assigned/prescribed temperature without transition to higher step/stage of conditional pressure.

Key: (1). Designation. (2). Conditional pressures. (3). Test pressures. (4). Temperature of medium in °C. (5). Greatest operating pressures. (6). Tubes, fittings and connecting pieces made of carbon steel. (7). Fittings and connecting pieces from cast iron (gray and ductile). (8). The same, from bronze and brass. (9). To.

Pages 9, 10 and 11.

1.2. The internal diameters of fittings, fittings and conduit/manifolds.

Tubes, fittings, compensators, sludge pans, flanges, plug/silencers and the parts of conduit/manifolds (branch/removals, junctions, -pieces, etc.), and also the equipment component of thermal grid/networks they must be manufactured under the internal diameters according to GOST 355-52 (Table 1.2) and be designated by this internal diameter.

The internal diameter for the cast tubes and fittings corresponds to their real bore, but for the steel tubes of thermal grid/networks - to the averaged according to wall thickness bore.

The internal diameters of flanges and connecting pieces (branch/removals, junctions, etc.) are accepted according to the internal diameter of those pipes for which they are intended.

1.3. Climatological data on some cities of the USSR.

Table 1.3 gives climatological data on some cities of the USSR. The temperature of surrounding air, the duration of heating period and seismicity for these cities are accepted on SNIP 11-A, 6-62, the duration of the standing of the temperatures of surrounding air during heating period is designed on climatological handbooks. Data on mean temperature of the soil are given in Table 14.

Table 1.2. Arbitrary passes of fittings, fittings and conduit/manifolds (according to GOST 355-52).

(1) Условный проход D_y в мм	(2) Трубная резьба в дюймах	(1) Условный проход D_y в мм	(2) Трубная резьба в дюймах	(1) Условный проход D_y в мм	(2) Трубная резьба в дюймах
15	⅜	150	6	450	—
20	¾	175*	7*	500	—
25	1	200	8	600	—
32	1 ¼	225*	9*	700	—
40	1 ½	250	10	800	—
50	2	275*	11*	900	—
60*	—	300	12	1000	—
70	2 ½	325*	—	1100*	—
80	3	350	—	1200	—
100	4	375*	—	—	—
125	5	400	—	—	—

Key: (1). the internal diameter D_y in mm. (2). The pipe thread in inches.

FOOTNOTE *. For the conduit/manifolds of thermal grid/networks, they are not applied. ENDFOOTNOTE.

Table 1.3. The calculated temperatures of surrounding air, the duration of the standing of the temperatures of surrounding air for heating period, the duration of heating period and seisnicity from 7 points are above.

(a) № п/п	(b) Наименование городов	(c) Температура наружного воздуха в °С: (d) расчетная для проектирования: (e) отопления	(f) вентиляции	(g) средняя отопительного периода	(h) Число суток за отопительный период со среднесуточными температурами наружного воздуха в °С: (i) ниже −45	−45 −40	−40 −35	−35 −30	−30 −25	−25 −20	−20 −15	−15 −10	−10 −5	−5 0	0 +8	(j) Продолжительность отопительного периода в сутках	(k) сейсмичность с 7 баллов и выше
(1a)	Европейская часть СССР																
1	Архангельск	−32	−17	−4,7	—	0,05	0,3	1,6	4,3	9,4	18,5	31,9	45,4	67,55	75	254	—
2	Астрахань	−22	−11	−2	—	—	—	—	0,32	1,54	5,2	13,9	26,5	64,54	59	171	—
3	Баку	− 3	− 1	4,8	—	—	—	—	—	—	—	—	—	—	110	110	7
4	Брянск	−23	−12	−2,2	—	—	—	0,1	0,6	3	11,1	21,6	35,8	60,8	63	196	—
5	Вильнюс	−21	− 9	−0,7	—	—	—	—	0,12	0,84	4,5	11,8	27,1	77,64	79	201	—
6	Витебск	−23	−11	−2	—	—	—	0,05	0,6	2,52	8,1	21,3	35,8	70,63	70	209	—
7	Вологда	−28	−16	−4,2	—	—	0,1	1,3	3	7	15,7	28,1	42	62,8	72	232	—
8	*Воронеж*	−25	−14	−3,7	—	—	—	0,3	1,1	4,6	13,6	22,4	35,6	63,4	54	195	—
9	Волгоград	−25	−14	−3,6	—	—	—	0,03	0,5	4,7	12,3	21,1	30	60,37	49	178	—
10	Горький	−28	−17	−4,9	—	—	0,1	0,93	3,1	7,58	16,9	27,7	40,3	62,39	58	217	—
11	Грозный	−16	− 8	0,3	—	—	—	—	—	0,2	1,8	6,7	15,4	58,9	73	156	7
12	Жданов (Донецкая обл.)	−20	− 9	−0,7	—	—	—	—	—	0,5	4,1	10,4	25,6	66,4	68	175	—
13	Златоуст (Челябинская обл.)	−32	−20	−6,4	—	—	0,2	1,82	5,9	12,8	25,12	39,5	42,24	47,42	60	235	—
14	Иваново	−28	−16	−4,4	—	—	0,23	1,3	2,5	7,2	15	27,6	32,4	71,77	65	223	—
15	Казань	−29	−18	−5,9	—	—	0,03	0,82	3,6	9,2	19,23	30,6	39,6	54,92	59	217	—
16	Калинин	−25	−14	−3,3	—	—	—	0,6	1,62	4,65	14,8	23,5	39,2	66,63	67	218	—
17	Киев	−21	−10	−1,2	—	—	—	—	0,12	0,92	5	13,5	28,6	69,86	73	191	—
18	Киров	−31	−19	−5,9	—	—	0,26	2,27	4,7	10,6	22,14	33,2	43,27	52,56	62	231	—
19	Кировоград	−21	− 9	−0,8	—	—	—	—	0,12	0,94	4,54	12,72	28,12	65,56	70	180	—
20	Кишинев	−16	− 7	0,6	—	—	—	—	—	0,1	1,8	7,5	16,04	63,56	78	167	—
21	Краснодар	−17	− 6	1,3	—	—	—	—	0,03	0,6	1,52	5,6	13,1	43,15	85	149	—
22	Куйбышев	−29	−18	−5,8	—	—	0,03	0,4	4,3	12	20,4	24,9	38	58,97	51	208	—
23	Курск	−25	−13	−3,1	—	—	—	0,12	0,5	3,4	10,3	22,1	36,1	63,18	64	200	—
24	Ленинград	−24	−12	−2	—	—	—	0,04	0,5	2,87	8,9	19,44	37,1	74,15	80	223	—

Table 1.3 (cont.)

(a) № п/п	(b) Наименование городов	Температура наружного воздуха в °С (c) расчетная для проектирования: отопления	вентиляции	(g) средняя отопительного периода	(h) Число суток за отопительный период со среднесуточными температурами наружного воздуха в °С: ниже −45	−45 −40	−40 −35	−35 −30	−30 −25	−25 −20	−20 −15	−15 −10	−10 −5	−5 0	0 +8	(i) Продолжительность отопительного периода в сутках	(k) Скорость ветра 7 баллов и выше
25	Лиепая (Латвийская ССР)	−17	−6	1,2	—	—	—	—	0,02	0,14	1,4	6,5	16,82	75,12	104	204	—
26	Луганск	−22	−11	−1,7	—	—	—	0,06	0,29	2,2	6,7	15,94	27,72	62,09	65	180	—
27	Львов	−16	−7	0,2	—	—	—	—	0,06	0,21	1,4	7	20,71	64,62	91	185	—
28	Магнитогорск	−33	−22	−7,7	—	0,3	0,8	1,6	5,2	15,6	28,8	54	35	29,7	50	221	—
29	Махачкала	−13	−4	2,4	—	—	—	—	—	0,12	0,56	2,32	7,8	32,2	109	152	—
30	Минск	−22	−10	−1,4	—	—	—	—	0,35	1,83	6,8	15,52	30,1	79,4	72	206	—
31	Москва	−26	−15	−3,7	—	—	0,02	0,45	2,04	5,4	13,82	24,7	39,3	65,27	60	212	—
32	Мурманск	−26	−14	−3,2	—	0,04	0,3	1,1	3,9	9,1	18,1	31,9	48,4	74,16	94	281	—
33	Нижний Тагил (Свердловская обл.)	−33	−21	−6,5	—	0,2	0,6	1,3	4,3	12,9	23,7	55	39	33	63	249	—
34	Николаев	−18	−7	0,5	—	—	—	—	0,02	0,3	2,22	9,2	18,7	59,56	75	165	—
35	Новгород	−24	−12	−2,9	—	—	0,2	0,9	1,9	5,6	14	27,9	42,6	52,9	79	225	—
36	Новороссийск	−12	−4	4,1	—	—	—	—	—	—	—	—	—	—	125	125	—
37	Одесса	−15	−7	1,1	—	—	—	—	—	0,2	0,87	5,42	16,1	58,41	79	160	—
38	Оренбург	−28	−20	−6,8	—	—	0,2	1,24	5,5	13,9	23,3	31,4	34,6	46,86	47	204	—
39	Орск (Оренбургская обл.)	−31	−22	−7,7	—	—	0,14	1,1	7,24	17,1	26	31,6	30,9	47,62	48	210	—
40	Пенза	−28	−17	−4,7	—	—	0,07	0,4	1,82	7,37	18,2	31,3	40,4	53,44	58	211	—
41	Пермь	−31	−20	−6,4	—	0,12	0,52	2,5	6	11,9	21,8	33,7	42,62	50,84	56	225	—
42	Петрозаводск	−26	−14	−2,9	—	—	—	0,17	1,52	5,45	12,9	24,52	41,92	75 52	78	237	—
43	Псков	−23	−11	−1,8	—	—	—	0,03	0,8	2,93	7,5	18,5	31,2	78,34	73	212	—
44	Рига	−19	−8	−0,4	—	—	—	—	0,1	0,5	3,33	11,2	23,84	81,03	92	212	—
45	Ростов-на-Дону	−22	−10	−1,4	—	—	—	—	0,2	1,5	5,7	13,1	25,65	65,85	62	175	—
46	Рязань	−27	−15	−4	—	—	0,03	0,5	1,9	5,33	14,5	26,2	38	64,54	53	209	—
47	Саратов	−28	−17	−4,5	—	—	—	0,1	1,5	8,1	18	27,3	36,8	57,2	47	196	—
48	Свердловск	−32	−21	−6,5	—	0,02	0,42	1,82	6	12,2	21,14	38,0	43,25	44,14	63	228	—
49	Смоленск	−24	−13	−2,6	—	—	—	0,1	0,83	3,4	10,33	20,9	36	73,14	68	213	—
50	Сыктывкар (Коми АССР)	−32	−20	−6,1	—	0,4	1,4	3,8	7,5	12	20,5	32,9	43,6	53,9	69	245	—
51	Таллин	−21	−10	−0,6	—	—	—	—	0,02	0,7	4,0	13,8	30,9	81,58	90	221	—
52	Тбилиси	−7	−2	2,3	—	—	—	—	—	—	—	—	—	—	150	150	—
53	Тула	−26	−14	−3,4	—	—	0,1	0,3	0,6	1,9	5,7	10,1	83,0	44	65	211	—
54	Ульяновск	−29	−18	−5,4	—	—	—	0,5	3,4	9,9	19,6	30,2	37,3	52,1	60	213	—
55	Уральск (Западно-Казахстанская обл.)	−28	−19	−6,3	—	—	0,1	0,6	3,4	11	20,5	29,7	31,6	51,1	50	241	—
56	Уфа	−31	−19	−6,2	—	—	0,22	1,4	5,04	11,4	22,8	33,2	41,1	46,84	58	218	—
57	Харьков	−23	−11	−2,5	—	—	—	0,02	0,4	1,9	7,9	17,2	31,6	67,98	63	180	—
58	Челябинск	−32	−21	−6,8	—	—	0,3	1,32	5,3	14,8	24,6	34,9	40,63	41,15	59	222	—
(58a)	Азиатская часть СССР																
59	Актюбинск	−29	−21	−7,1	—	—	0,03	0,9	5,5	13,6	24,3	29,2	35	49 46	48	206	—
60	Алма-Ата	−24	−13	−3	—	—	—	—	0,4	2,8	7,6	19	36,1	58,1	55	179	9
61	Барнаул	−36	−23	−8,1	0,04	0,44	1,7	4,9	10,2	16,7	25,8	34,1	36,4	41,72	52	224	—
62	Владивосток	−24	−16	−4,7	—	—	—	—	0,1	3,7	17,8	34,9	36,1	45,4	67	205	—
63	Иркутск	−35	−23	−8,8	—	0,3	2,1	4,8	11,9	16,9	36	36	29,6	42,1	63	243	8
64	Караганда	−32	−20	−7,2	—	0,14	1,3	3,1	6,9	12,85	20,25	31,9	40,2	53,35	47	217	—
65	Красноярск	−37	−22	−7,5	0,02	0 72	2,7	5,3	10,8	14,9	22,1	31,6	37,1	42,76	63	231	—
66	Кустанай	−35	−23	−8,4	—	0,13	0,2	2,8	10,1	19,2	27,13	32,9	36	40,54	48	217	—
67	Ленинск-Кузнецкий (Кемеровская обл.)	−28	−23	−7,7	—	0,15	2,4	4,54	9,7	15,3	24,44	30,3	40,5	50,67	49	227	—
68	Минусинск (Красноярский край)	−40	−25	−8,2	—	1,1	3,3	7,3	13,3	19,4	24,8	30,4	31,1	42,3	57	230	—
69	Новосибирск	−39	−21	−8,9	—	0,63	3,1	4,8	11,8	17,63	26,9	36,1	35,2	40,84	50	228	—
70	Омск	−36	−21	−8,9	0,02	0,21	2,44	5,4	12,1	19,5	29,6	34,2	34,4	39,13	50	227	—
71	Павлодар (Целинный край)	−35	−23	−8,9	0,04	0,23	0,9	3,4	11,7	23,14	29,1	33	33	34,49	4	212	—
72	Петропавловск (Целинный край)	−36	−24	−8,8	—	0,13	0,9	3,8	10,5	21	29,2	35,8	36,23	37,44	50	225	—
73	Самарканд	−12	3	2,9	—	—	—	—	—	—	0,4	2,7	9,3	18,6	93	124	7
74	Семипалатинск	−35	−21	−7,5	—	0,25	1,8	3,4	7,9	15,4	24,6	29,9	35,4	42,35	49	210	—

Table 1.3 (cont.)

(a) № п/п	(b) Наименование городов	(c) Температура наружного воздуха в °С: (d) расчетная для проектирования: отопления	вентиляции	(e) средняя отопительного периода	(h) Число суток за отопительный период со среднесуточными температурами наружного воздуха в °С: (f) ниже −45	−45 −40	−40 −35	−35 −30	−30 −25	−25 −20	−20 −15	−15 −10	−10 −5	−5 0	+0 +8	(i) Продолжительность отопительного периода в сутках	(j) Абсолютная влажность в 7 часов и выше
75	Ташкент	−13	−4	2	—	—	—	—	—	—	1,3	4,8	11,6	23,3	90	131	—
76	Тобольск (Тюменская обл.)	−35	−24	−8,1	—	0,24	1,54	4,8	9,5	18,2	28,3	35,6	38,8	33,02	65	235	—
77	Томск	−39	−25	−8,7	0,14	0,57	2,7	6,1	11,3	18,14	28	37	36,6	43	55	238	—
78	Тюмень	−33	−22	−7,2	—	0,2	0,84	3,9	7,3	15,8	24,8	35,6	38,9	41,66	57	226	—
79	Хабаровск	−33	−25	−9,8	—	—	0,1	2,1	12,3	28,2	35,8	29,8	26,6	27,1	80	220	—
80	Чита	−38	−30	−11,7	—	0,9	5,2	13,8	23,9	31,1	30,8	26,1	28,1	24,1	80	243	—

Notes: 1. The calculated temperature of surrounding air for the design of heating is accepted as average of the coldest five-day week from eight of winters. of those who were undertaken to 50 years.

2. Calculated temperature of surrounding air for design of ventilations is accepted as mean temperature of air of coldest period, which is 15o/o of common/general/total duration of entire heating period.

3. Duration of heating period is determined by number of days with stable daily mean temperature of surrounding air +8°C and it is below.

4. Average temperature of surrounding air of heating period is accepted as average algebraic as heating period.

5. Intensity of earthquakes at points is evaluated according to GOST 6249-52.

KeY: (a). in sequence. (b). Designation of cities. (c). Temperature of surrounding air in °C. (d). calculated for a design. (e). heating. (f). ventilation. (g). the average of heating period. (h). Number of days during heating period

with the daily mean temperatures of surrounding air in °C.) (i). it is below. (j). Duration of heating period a day. (k). Seismicity from 7 points is above. (1). Arkhangelsk. (2). Astrakhan. (3). Baku. (4). Bryansk. (5). Vilnyus. (6). Vitebsk. (7). Vologda. (8). Voronezh. (9). Volgograd. (10). Gorkiy. (11). Groznyy. (12). Zhdanov (Donets reg.). (13). Zlatoust (Chelyabinsk reg.). (14). Ivanovo. (15). Kazan. (16). Kalinin. (17). Kiev. (18). Kirov. (19). Kirovograd. (20). Kishinev. (21). Krasnodar. (22). Kuybyshev. (23). Kursk. (24). Leningrad. (25). Liyepaya (Latvian SSR). (26). Lugansk. (27). L'vov. (28). Magnitogorsk. (29). Makhachkala. (30). Minsk. (31). Moscow. (32). Murmansk. (33). Nizhnyy Tagil (Sverdlovsk reg.). (34). Nikolaev. (35). Novgorod. (36). Novorossisk. (37). Odessa. (38). Orenburg. (39). Orsk (Orenburg reg.). (40). Penza. (41). Permian period. (42). Petrozavodsk. (43). Pskov. (44). Riga. (45). Rostov on the Don. (46). Ryazan. (47). Saratov. (48). Sverdlovsk. (49). Smolensk. (50). Syktyvkar (Komi ASSR). (51). Tallin. (52). Tbilisi. (53). Tula. (54). Ul'yanovsk. (55). Ural'sk (Western-Kazakhstan reg.). (56). Ufa. (57) Khar'kov. (58). Chelyabinsk. (58a). Asian part of the USSR. (59). Aktyubinsk. (60). Alma Ata. (61). Barnaul. (62). Vladivostok. (63). Irkutsk. (64). Karaganda. (65). Krasnoyarsk. (66). Kustanay. (67). Leninsk-Kuznetskiy (Kemerov reg.). (68).

Minusinsk (Krasnoyarsk district). (69). Novosibirsk. (70). Omsk. (71). Pavlodar (Tselina district). (72). Petropavlovsk (Tselina district). (73). Samarkand. (74). Semipalatinsk. (75). Tashkent. (76). Tobol'sk (Tyumen' reg.). (77). Tomsk. (78). Tyumen'. (79). Khabarovsk. (80). Chita.

Table 1.4. Mean temperature of soil in °C for certain points of the USSR.

(1) Наименование городов	(4) Зимняя		(3) Летняя		(4) Годовая		(1) Наименование городов	(2) Зимняя		(3) Летняя		(4) Годовая	
	(5) Глубина грунта в м							(5) Глубина грунта в м					
	0,8	1,6	0,8	1,6	0,8	1,6		0,8	1,6	0,8	1,6	0,8	1,6
(6) Брест	1,2	3,1	19,1	16,4	9,7	9,6	(15) Москва	1	1,6	14,4	13,4	6,5	6,5
(7) Бежецк	0,5	1,9	17,4	15,4	8,3	8,2	(16) Минск	1	2,9	11,8	10,7	8,5	8,4
(8) Вологда	1	2	13,2	10,9	5,9	5,9	(17) Одесса	3,2	5,5	23	19,6	12,7	12,5
(9) Волгоград	−1,9	0,7	23,7	19,5	10,1	10,2	(18) Орел	0	1,8	17,2	14,8	7,5	7,6
(10) Гродно	0,3	1,5	19,4	16,1	8,4	8,3	(19) Оренбург	−1,1	1,9	15,6	12,5	6,8	7,1
(11) Даугавпилс	−1,6	−0,1	18,5	17,7	5,5	5,8	(20) Ростов-на-Дону	0,8	4,8	20,2	16,6	10,4	10,7
(12) Иваново	−0,1	1,3	15	13,3	6,2	6,3	(21) Рига	−1,3	−0,3	16,5	16,2	6,2	6,3
(13) Киев	1	2,7	17,3	15,1	8,5	8,5	(22) Свердловск	0,75	2,7	12	9,1	6	5,5
(14) Ленинград	−2,5	0,7	16,3	13,7	5,4	5,9	(23) Харьков	1,5	2,7	17,1	15,7	8,8	8,9

Key: (1). Designation of cities. (2). Winter. (3). Summer. (4). annual. (5). Depth of soil in m. (6). Brest. (7). Bezhetsk. (8). Vologda. (9). Volgograd. (10). Grodno. (11). Daugavpils. (12). Ivanovo. (13). Kiev. (14). Leningrad. (15). Moscow. (16). Minsk. (17). Odessa. (18). Orel. (19). Orenburg. (20). Rostov on the Don. (21). Riga. (22). Sverdlovsk. (23). Kharkov.

Pages 12, 13 and 14.

1.4. Properties of water and water vapor.

Tables 1.5-1.7 the basic thermodynamic and physical properties of water and water vapor, comprised according to literature data of reference.

Table 1.5. Thermodynamic properties of the dry saturated steam and water on the line of saturation.

(1) Давление P в кгс/см²	(2) Температура насыщения t_s в °С	(3) Сухой насыщенный пар: (4) удельный вес γ'' в кгс/м³	(5) энтальпия i'' в ккал/кг	(6) Вода на линии насыщения: (7) удельный вес γ' в кгс/м³	(8) энтальпия i' в ккал/кг	(9) Скрытая теплота парообразования r в ккал/кг
1	99,09	0,5797	638,8	958	99,19	539,6
1,1	101,76	0,6337	639,8	957	101,87	537,9
1,2	104,25	0,6873	640,7	955	104,38	536,3
1,3	106,56	0,7407	641,6	955	106,72	534,9
1,4	108,74	0,7943	642,3	952	108,92	533,4
1,5	110,79	0,8467	643,1	951	110,99	532,1
1,6	112,73	0,9001	643,8	950	112,95	530,8
1,7	114,57	0,9524	644,5	949	114,81	529,7
1,8	116,33	1,0046	645,1	947	116,6	528,5
1,9	118,01	1,057	645,7	946	118,3	527,4
2	119,62	1,109	646,3	945	119,94	526,4
2,1	121,16	1,161	646,8	944	121,5	525,3

(1) Давление P в кгс/см²	(2) Температура насыщения t_s в °С	(3) Сухой насыщенный пар: (4) удельный вес γ'' в кгс/м³	(5) энтальпия i'' в ккал/кг	(6) Вода на линии насыщения: (7) удельный вес γ' в кгс/м³	(8) энтальпия i' в ккал/кг	(9) Скрытая теплота парообразования r в ккал/кг
3,4	137,18	1,823	652,1	930	137,8	511,3
3,5	138,19	1,873	652,4	929	138,9	513,5
3,6	139,18	1,923	652,7	929	139,9	512,8
3,7	140,15	1,974	653	927	140,9	512,1
3,8	141,09	2,024	653,3	925	141,8	511,5
3,9	142,02	2,074	653,6	925	142,8	510,8
4	142,92	2,124	653,9	925	143,7	510,2
4,1	143,81	2,173	654,1	924	144,6	509,5
4,2	144,68	2,223	654,4	922	145,5	508,9
4,3	145,54	2,273	654,7	922	146,4	508,3
4,4	146,38	2,323	654,9	921	147,3	507,6
4,5	147,2	2,373	655,2	920	148,1	507,1

Table 1.5 (cont.)

(1) Давление P в кг/см²	(2) Температура насыщения t_s в °C	(3) Сухой насыщенный пар: (4) удельный вес γ'' в кгс/м³	(3) Сухой насыщенный пар: (5) энтальпия i'' в ккал/кг	(6) Вода на линии насыщения: (6) удельный вес γ' в кгс/м³	(6) Вода на линии насыщения: (6) энтальпия i' в ккал/кг	(7) Скрытая теплота парообразования r в ккал/кг
2.2	122.65	1.212	647.3	941	123	524.3
2.3	124.08	1.264	647.8	940	121.5	523.3
2.4	125.46	1.315	648.3	940	125.9	522.4
2.5	126.79	1.367	648.7	939	127.2	521.5
2.6	128.08	1.417	649.2	938	128.5	520.7
2.7	129.34	1.469	649.6	937	129.8	519.8
2.8	130.55	1.52	650	936	131.1	518.9
2.9	131.73	1.57	650.3	935	132.3	518
3	132.88	1.621	650.7	934	133.4	517.3
3.1	134	1.672	651.1	932	134.6	516.5
3.2	135.08	1.722	651.4	930	135.7	515.7
3.3	136.14	1.772	651.8	930	136.8	515
6.6	161.92	3.404	659.3	905	163.2	496.1
6.8	163.01	3.501	659.6	905	164.5	495.1
7	164.17	3.6	659.9	904	165.1	494.2
7.2	165.31	3.697	660.2	903	166.9	493.3
7.4	166.42	3.794	660.4	901	168	492.4
7.6	167.51	3.891	660.7	900	169.2	491.5
7.8	168.57	3.989	661	899	170.3	490.7
8	169.61	4.085	661.2	898	171.4	489.8
8.2	170.63	4.182	661.4	897	172.4	489
8.4	171.63	4.279	661.7	896	173.4	488.3
8.6	172.61	4.375	661.9	895	174.5	487.4
8.8	173.58	4.472	662.1	894	175.5	486.6
9	174.53	4.568	662.3	893	176.5	485.8
9.2	175.46	4.664	662.5	892	177.5	485
9.4	176.38	4.762	662.7	890	178.5	484.2
9.6	177.28	4.859	662.9	890	179.4	483.5
4.6	148.01	2.422	655.4	920	149	506.5
4.7	148.81	2.472	655.6	920	149.8	505.8
4.8	149.59	2.521	655.9	919	150.6	505.3
4.9	150.36	2.571	656.1	918	151.4	504.7
5	151.11	2.62	656.3	916	152.1	504.2
5.2	152.59	2.718	656.7	915	153.7	503
5.4	154.02	2.817	657.1	914	155.1	502
5.6	155.41	2.915	657.5	912	156.6	500.9
5.8	156.76	3.013	657.9	912	158	499.9
6	158.08	3.111	658.3	910	159.3	498.9
6.2	159.38	3.209	658.6	909	160.7	497.9
6.4	160.61	3.307	659	906	162	497
13	190.71	6.494	665.6	875	193.6	472
13.5	192.45	6.734	665.9	874	195.5	470.4
14	194.13	6.974	666.2	872	197.3	468.9
14.5	195.77	7.21	666.4	870	199.1	467.4
15	197.36	7.452	666.7	868	200.7	465.9
15.5	198.91	7.692	666.9	866	202.4	464.5
16	200.43	7.93	667.1	865	204	463.1
16.5	201.91	8.17	667.3	864	205.6	461.7
17	203.35	8.41	667.5	861	207.2	460.3
17.5	204.76	8.651	667.7	859	208.7	459
18	206.14	8.889	667.8	858	210.2	457.6
18.5	207.49	9.132	668	855	211.7	456.3
19	208.81	9.372	668.2	854	213.1	455.1
19.5	210.11	9.615	668.3	853	214.5	453.8
20	211.38	9.852	668.5	851	215.9	452.6
20.5	212.63	10.09	668.6	850	217.3	451.3

Table 1.5 (cont.)

(1) Давление P в кг/см²	(2) Температура насыщения t_s в °С	(3) Сухой насыщенный пар		(4) Вода на линии насыщения		(7) Скрытая теплота парообразования r в ккал/кг
		(4) Удельный вес γ'' в кгс/м³	(5) Энтальпия i'' в ккал/кг	(6) Удельный вес γ' в кгс/м³	(6) Энтальпия i' в ккал/кг	
9,8	178,16	4,953	663,1	889	180,3	482,8
10	179,04	5,051	663,3	889	181,3	482,1
10,5	181,16	5,291	663,7	887	183,5	480,2
11	183,2	5,531	664,1	884	185,7	478,4
11,5	185,17	5,77	664,5	881	187,7	476,8
12	187,08	6,013	664,9	880	189,8	475,1
12,5	188,92	6,254	665,3	879	191,7	473,6
24,5	221 83	12,03	669,2	838	227,4	441,8
25	222,9	12,27	669,3	836	228,6	440,7
25,5	223,95	12,51	669,3	835	229 5	439 5
26	224,99	12,76	669,4	834	230,9	438,5
26,5	226,01	13	669,4	833	232,1	437,3
27	227,01	13,24	669,4	831	233,2	436,2
27,5	228	13,49	669,5	830	234,3	435,2
28	228,98	13,73	669,5	829	235,4	434,1
28,5	229,94	13,98	669,5	829	236,5	433
29	230,89	14,22	669,5	825	237,5	432
29,5	231,83	14,47	669,6	824	238,6	431
30	237,76	14,71	669,6	824	239,6	430
31	234,57	15,2	669,6	821	241,7	427,9
32	236,35	15,7	669,6	820	243,7	425,9
33	238,08	16,19	669,6	817	245,6	423,9
34	239,77	16,68	669,5	815	247,6	421,9
35	241,42	17,18	669,5	812	249,5	420
36	243,04	17,69	669,4	810	251,3	418 1

(1) Давление P в кгс/см²	(2) Температура насыщения t_s в °С	(3) Сухой насыщенный пар		(4) Вода на линии насыщения		(7) Скрытая теплота парообразования r в ккал/кг
		(4) Удельный вес γ'' в кгс/м³	(5) Энтальпия i'' в ккал/кг	(6) Удельный вес γ' в кгс/м³	(6) Энтальпия i' в ккал/кг	
21	213,85	10,34	668,7	849	218,6	450,1
21,5	215,05	10,57	668,8	846	220	448,8
22	216,23	10,82	668,9	845	221,2	447,7
22,5	217,39	11,06	668,9	844	222,5	446,4
23	218,53	11,3	669	842	223,8	445,2
23,5	219,65	11,54	669,1	841	225	444,1
24	220,75	11,78	669,2	839	226,2	443
42	252,07	21,71	668,8	796	261,8	407
43	253,48	21,22	668,7	795	263,4	405,3
44	254,87	21,73	668,5	792	265	403,5
45	256,23	22,25	668,4	790	266,6	401,8
46	257,56	22 76	668,2	788	268,2	400
47	258,88	23,28	668	785	269,8	398,2
48	260,17	23,79	667,9	784	271,3	396,6
49	261,45	24,32	667,7	782	272,8	394,9
50	262,7	24,84	667,5	780	274,3	393,2
51	263,93	25,36	667,4	779	275,8	391,6
52	265,15	25,89	667,2	777	277,2	390
53	266,35	26,42	667	775	278,7	388,3
54	267,53	26,95	666,7	772	280,1	386,6
55	268,69	27,48	666,6	770	281,5	385,1
56	269,84	28,02	666,3	768	282,9	383,4
57	270,98	28,56	666,1	767	284,3	381,8
58	272,1	29,1	665,9	765	285,6	380,3
59	273,2	29,64	665,6	762	287	378,6

Table 1.5 (cont.)

37	244.62	18.19	669.3	808	253.1	416.2	60	274.29	30.18	665.4	760	284.3	377.1
38	246.17	18.68	669.2	805	254.9	414.3	61	275.37	30.72	665.1	759	289.7	375.4
39	247.69	19.19	669.2	803	256.7	412.5	62	276.43	31.28	664.8	758	291	373.8
40	249.18	19.7	669	801	258.4	410.6	63	277.48	31.83	664.6	755	292.3	372.3
41	250.64	20.2	668.9	798	260.1	408.8	64	278.51	32.37	664.3	754	293.6	370.8

Key: (1). Pressure P in kg/cm². (2). Temperature of saturation t_s in °C. (3). Dry saturated vapor. (4). specific gravity/weight γ'' in kg/m³. (5). enthalpy i'' in kcal/kg. (6). Water on the line of saturation. (7). Heat of vaporization r in kcal/kg.

Page 15.

Table 1.6. The specific gravity/weight of the superheated steam γ in kg/m³.

(1) p, кгс/см²	(2) Температура перегрева в °С																	
	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440
1	0,578	0,546	0,52	0,494	0,472	0,452	0,433	0,415	0,4	0,386	0,372	0,359	0,347	0,336	0,326	0,316	0,308	0,298
1,1	—	0,601	0,571	0,545	0,52	0,497	0,477	0,457	0,44	0,425	0,41	0,395	0,381	0,37	0,358	0,348	0,338	0,328
1,2	—	0,657	0,624	0,595	0,567	0,542	0,52	0,5	0,48	0,462	0,445	0,431	0,417	0,404	0,392	0,38	0,367	0,358
1,3	—	0,713	0,677	0,645	0,615	0,589	0,564	0,541	0,52	0,501	0,484	0,467	0,451	0,436	0,424	0,411	0,399	0,388
1,4	—	0,77	0,73	0,695	0,664	0,635	0,608	0,583	0,56	0,54	0,521	0,504	0,486	0,471	0,456	0,443	0,43	0,418
1,5	—	0,825	0,783	0,745	0,71	0,68	0,651	0,625	0,601	0,58	0,558	0,539	0,522	0,505	0,489	0,475	0,461	0,448
1,6	—	0,98	0,835	0,795	0,76	0,725	0,695	0,619	0,642	0,618	0,596	0,575	0,556	0,54	0,522	0,506	0,492	0,478
1,7	—	0,94	0,89	0,845	0,805	0,771	0,74	0,71	0,681	0,657	0,635	0,611	0,59	0,572	0,555	0,539	0,523	0,508
1,8	—	0,994	0,941	0,896	0,854	0,816	0,782	0,751	0,722	0,69 5	0,67	0,647	0,626	0,606	0,588	0,57	0,554	0,538
1,9	—	1,05	0,995	0,946	0,902	0,861	0,826	0,793	0,763	0,735	0,708	0,684	0,66	0,64	0,62	0,602	0,585	0,568
2	—	1,108	1,049	0,999	0,95	0,908	0,87	0,836	0,804	0,773	0,745	0,72	0,698	0,674	0,653	0,634	0,615	0,598
2,2	—	—	1,155	1,098	1,047	1	0,958	0,92	0,884	0,85	0,82	0,801	0,765	0,742	0,719	0,697	0,677	0,657
2,4	—	—	1,26	1,2	1,142	1,09	1,045	1,003	0,965	0,93	0,896	0,865	0,835	0,81	0,785	0,76	0,739	0,718
2,6	—	—	1,37	1,3	1,24	1,185	1,134	1,09	1,045	1,007	0,97	0,938	0,905	0,875	0,85	0,825	0,801	0,778
2,8	—	—	1,48	1,4	1,34	1,28	1,22	1,17	1,13	1,09	1,05	1,01	0,98	0,95	0,92	0,89	0,86	0,84
3	—	—	1,59	1,51	1,44	1,37	1,31	1,26	1,21	1,16	1,12	1,08	1,05	1,01	0,98	0,95	0,92	0,9
3,2	—	—	1,7	1,61	1,53	1,46	1,4	1,34	1,29	1,24	1,22	1,16	1,12	1,08	1,05	1,01	0,99	0,96
3,4	—	—	1,81	1,71	1,63	1,56	1,49	1,43	1,37	1,32	1,27	1,23	1,19	1,15	1,11	1,08	1,05	1,02
3,6	—	—	1,92	1,82	1,73	1,65	1,58	1,51	1,45	1,4	1,35	1,3	1,26	1,22	1,18	1 14	1,11	1,08
3,8	—	—	—	1,92	1,83	1,74	1,67	1,6	1,53	1,48	1,42	1,375	1,33	1,285	1,245	1,21	1,17	1,14
4	—	—	—	2,02	1,93	1,84	1,76	1,68	1,62	1,56	1,5	1,45	1,4	1,36	1,31	1,27	1,23	1,2
4,2	—	—	—	2,13	2,03	1,93	1,85	1,77	1,7	1,63	1,58	1,52	1,47	1,42	1,38	1,34	1,29	1,26
4,4	—	—	—	2,24	2,12	2,03	1,94	1 86	1,78	1,71	1,65	1,6	1,54	1,49	1,44	1,4	1,36	1,32
4,6	—	—	—	2,34	2,22	2,12	2,03	1,94	1,86	1,79	1,73	1,67	1,61	1 56	1,51	1,46	1,42	1,38
4,8	—	—	—	2,44	2,32	2,22	2,12	2,025	1,945	1,87	1,8	1,74	1,68	1,62	1,57	1,53	1,48	1,44
5	—	—	—	2,56	2,42	2,31	2,21	2,11	2,03	1,95	1,88	1,81	1,75	1,69	1,64	1,59	1,54	1,5
5,5	—	—	—	2,82	2,68	2,51	2,43	2,33	2,24	2,14	2,07	1,995	1,93	1,86	1,81	1,75	1,7	1,65
6	—	—	—	3,1	2,93	2,79	2,63	2,51	2,44	2,35	2,26	2,18	2,11	2,04	1,97	1,91	1,86	1,8
6,5	—	—	—	—	3,19	3,03	2,89	2,76	2,65	2,55	2,45	2,37	2,29	2,21	2,14	2,07	2,01	1 95
7	—	—	—	—	3,44	3,27	3,12	2,98	2,86	2,74	2,64	2,55	2,46	2,38	2,3	2,23	2,16	2,1
7,5	—	—	—	—	3,7	3,51	3,35	3,2	3,07	2,95	2,84	2,74	2,64	2,55	2,47	2,39	2,32	2,26
8	—	—	—	—	3,96	3,76	3,58	3,42	3,28	3,15	3,03	2,92	2,82	2,72	2,64	2,56	2,48	2,41
8,5	—	—	—	—	4,22	4	3,81	3,64	3,49	3,35	3,22	3,1	3	2,9	2,8	2,72	2,64	2,56
9	—	—	—	—	4,5	4,25	4,05	3,86	3,7	3,56	3,42	3,29	3,18	3,07	2,95	2,88	2,79	2,71
9,5	—	—	—	—	4,75	4,51	4,28	4,08	3,91	3,75	3,61	3,48	3,36	3,24	3,14	3,04	2,95	2,86
10	—	—	—	—	5,04	4,75	4,51	4,3	4,12	3,96	3,8	3,66	3,54	3,42	3,3	3,2	3,1	3,02
11	—	—	—	—	—	5,26	5	4,76	4,55	4,36	4,19	4,04	3,89	3,77	3,63	3,53	3,42	3,32
12	—	—	—	—	—	5,8	5,48	5,22	4,98	4,78	4,58	4,42	4,25	4,12	3,98	3,86	3,74	3,62
13	—	—	—	—	—	6,31	5,97	5,68	5,42	5,2	4,98	4,8	4,62	4,46	4,32	4,18	4,05	3,93
14	—	—	—	—	—	6,85	6,48	6,15	5,85	5,6	5,39	5,17	4,99	4,87	4,65	4,5	4,37	4,24
15	—	—	—	—	—	7,4	6,97	6,61	6,31	6,03	5,78	5,56	5,36	5,17	5	4,83	4,69	4,55
16	—	—	—	—	—	—	7,48	7,09	6,75	6,45	6,19	5,94	5,73	5,53	5,34	5,16	5	4,85
17	—	—	—	—	—	—	8	7,56	7,21	6,88	6,6	6,33	6,1	5,88	5,68	5,5	5,32	5,16
18	—	—	—	—	—	—	8,51	8,05	7,65	7,31	7	6,71	6,46	6,24	6,02	5,83	5,64	5,47
19	—	—	—	—	—	—	9,05	8,54	8,1	7,74	7,4	7,11	6,83	6,6	6,35	6,15	5,96	5,78
20	—	—	—	—	—	—	9,58	9,04	8,56	8,16	7,8	7,5	7,21	6,95	6,71	6,49	6,28	6,09
21	—	—	—	—	—	—	10,1	9,525	9,04	8,6	8,225	7,9	7,6	7,31	7,06	6,82	6,6	6,4
22	—	—	—	—	—	—	10,7	10,01	9,5	9,05	8,65	8,29	7,97	7,68	7,41	7,16	6,92	6,71
23	—	—	—	—	—	—	11,23	11,55	10	9,48	9,01	8,67	8,35	8,04	7,75	7,49	7,25	7,03
24	—	—	—	—	—	—	—	11,05	10,45	9,95	9,48	9,05	8,73	8,41	8,1	7,84	7,59	7,44
25	—	—	—	—	—	—	—	11,6	10,9	10,39	9,91	9,5	9,12	8,76	8 45	8,19	7,9	7,65
26	—	—	—	—	—	—	—	12,1	11,4	10,8	10,3	9,9	9,5	9,13	8,8	8,5	8,22	7,95
27	—	—	—	—	—	—	—	12,65	11,9	11,3	10,75	10,3	9,88	9,5	9,15	8,83	8,55	8,29
28	—	—	—	—	—	—	—	13,2	12,4	11,74	11,2	10,7	10,3	9,87	9,52	9,2	8,9	8,59
29	—	—	—	—	—	—	—	13,74	12,9	12,2	11,6	11 1	10,65	10,25	9,87	9,52	9,21	8,9
30	—	—	—	—	—	—	—	14,3	13,4	12,7	12,1	11,5	11,05	10,6	10,2	9,86	9,55	9,22
31	—	—	—	—	—	—	—	14,9	13,9	13,15	12,5	11,9	11,45	11	10,6	10,2	9,87	9,55
32	—	—	—	—	—	—	—	15,5	14,45	13,6	12,94	12,35	11,84	11,38	10,95	10,56	9,2	9,85
33	—	—	—	—	—	—	—	16,08	15	14,1	13,4	12,8	12,2	11,75	11,3	10,9	9,54	10,2
34	—	—	—	—	—	—	—	16,7	15,5	14,6	13,84	13,2	12,6	12,14	11,7	11,25	10,9	10,5
35	—	—	—	—	—	—	—	—	16,1	15,1	14,3	13,6	13,01	12,5	12,04	11,6	11,2	10,82
36	—	—	—	—	—	—	—	—	16,6	15,6	14,76	14,05	13,45	12,9	12,4	11,93	11,5	11,15

Key: (1). in kgf/cm³. (2). Temperature of superheating in °C.

Page 16.

Table 1.7. Heat capacity of overheated water vapor c_p in kcal/kg °C at a constant pressure.

(1) Температура пара в °С	(2) c_p при давлении пара в кгс/см²				
	5	10	20	30	40
200	0,507	0,572	—	—	—
220	0,495	0,54	0,701	—	—
240	0,491	0,523	0,629	0,802	—
260	0,49	0,513	0,59	0,699	0,842
280	0,49	0,51	0,569	0,636	0,73
300	0,491	0,509	0,552	0,602	0,668
320	0,492	0,508	0,54	0,58	0,629
340	0,493	0,508	0,532	0,565	0,601
360	0,494	0,509	0,528	0,554	0,583
380	0,497	0,509	0,525	0,548	0,573
400	0,5	0,507	0,525	0,544	0,565
420	0,502	0,509	0,525	0,542	0,56
440	0,505	0,511	0,525	0,541	0,558

Key: (1). Vapor temperature in °C. (2). at vapor pressure in kg/cm².

Page 17.

Chapter 2

TUBES AND PARTS OF CONDUIT/MANIFOLDS.

2.1. Conditions for the selecting of tubes.

The conduit/manifolds of thermal grid/networks, which transport water vapor with pressure above 2 atm(abs.) or hot water with temperature more than 120°C, must satisfy the requirements for the "rules of device and safe operation of the pipelines of vapor and hot water", affirmed by Gosgortekhnadzor [State Committee of the Council of Ministers for Supervision of Industrial Safety and for Mining Inspection (RSFSR)] of the USSR on February 1957 according to which the pipelines of thermal

grid/networks are related to 2, 3 and the 4th to categories (Table 2.1).

In accordance with the indications of chapter SNIP [Construction norms and regulations] I-G-7-62 "Thermal grid/networks. Materials, equipment, reinforcement, articles and structures" for thermal grid/networks apply the following tubes:

steel seamless hot-rolled, by outside diameter from 32 to 426 mm, assortment GOST [All-union State Standard] 8732-58*, technical requirements GOST 8731-58*;

steel electric welding with the longitudinal seam and the calibrated ends, outside diameter from 426 to 1220 mm, assortment and technical requirements GOST 4015-58;

steel electric welding with bilateral spiral weld, outside diameter from 426 to 1220 mm, assortment and technical requirements GOST 8696-62;

steel water-gas conducting (gas), by outside diameter from 33.5 to 155 mm, assortment and technical requirements GOST 3262-62;

steel electric welding with the longitudinal seam, outside diameter from 32 to 133 mm, assortment and technical requirements GOST 1753-53.

Tubes steel electric welding by outside diameter from 32 to 1220 mm can be used according to GOST 10704-63 - GOST 10707-63 which will be introduced instead of GOST 4015-58 and GOST 1753-53.

Besides the enumerated types of tubes in thermal grid/networks, can be applied the tubes, manufactured according to special technical specifications (Table 2.2).

Application/use of tubes depending on the operational characteristics of heat carrier and mark/brands of steel is given in Table 2.3.

Table 2.1. Classification of pipelines from the parameters of heat carriers.

(1) Категория трубопровода	(2) Наименование теплоносителя	(3) Рабочие параметры теплоносителя	
		(4) давление (избыточное) в кгс/см²	(5) температура в °С
2	(6) Перегретый пар	(7) До 39	(8) Свыше 350 (9) до 450
	(9) Горячая вода, насыщенный пар	(8) (7) Свыше 80 до 184	(8) Свыше 120
3	(6) Перегретый пар	(7) До 22	(8) Свыше 250 (7) до 350
	(9) Горячая вода, насыщенный пар	(8) Свыше 16 до 80	(8) Свыше 120
4	(10) Перегретый и насыщенный пар, горячая вода	1—16	(8) (7) Свыше 120 до 200

Key: (1). Category of pipeline. (2). Designation of heat carrier. (3). Working parameters of heat carrier. (4). pressure (surplus) in kg/cm². (5). the temperature in °C. (6). The superheated steam. (7). To. (8). It is more than (9). Hot water, the saturated steam. (10). The overheated and saturated steam, hot water.

Table 2.2. Typical dimensions of steel electric welding tubes with the longitudinal seam.

(1) Технические условия на изготовление труб	(2) Гост; марка стали	(3) Наружный диаметр трубы $D_н$ в мм	(4) Толщина стенки трубы s в мм
(5) ЧМТУ Укр. НИТИ 450—63	14ГН, 19Г; 16ГН; 17ГС ГОСТ 5058—57*	529 720 820 1020	8 8, 9, 10, 11 9, 10, 11 11
(5) ЧМТУ Укр. НИТИ 182—60	14ХГС, МК; ГОСТ 5058—57*	529	8,9
ТУ 06—56	(6) Ст. 3 (7)(группы А); ГОСТ 380—60	478 529 630	9, 11, 12 9, 12 10, 12
(5) ЧМТУ Укр НИТИ 512—63 (временные) группы А (5)	(6) Ст. 2 кп; (6) Ст. 2; (6) Ст. 3 кп; (6) Ст. 3 (8)(группы А); ГОСТ 380—60; 10; 10кп; 20; 20кп; ГОСТ 1050—60	159 168 219	3, 3.5; 4; 4.5; 5; 6, 6.5; 7; 7.5, 8; 9; 10
		245 273 325	4; 4.5; 5; 6; 6,5; 7; 7.5; 8; 9; 10
		351 226 478 529	5; 6; 6,5; 7; 7,5; 8; 9; 10

Key: (1). Tochaical specifications for the manufacture of tubes. (2). GOST; trademark of steel. (3). Outside diameter of tube D_H in mm. (4). The wall thickness of tube s in mm. (5). Ukrainian. (6). St. (7). group. (8). time/temporal groups. (9). kp.

Page 18.

Steel carbonic good-quality structural according to GOST 1050-60 is manufactured in open-hearth and electrical

furnaces (steady, that boils and semikilled). Depending on the chemical composition, steel is subdivided into two groups - group I with the normal content of manganese (0.25-0.80o/o) of the mark/brands 10kp, 10, 20kp, 20, etc. and group II with the increased content of manganese (0.7-1.2o/o) of brands 15G, 20G, 25G, etc. (letter "G" designates the increased content of manganese);

Steel low-alloyed structural according to GOST 5058-57*

silicon manganese - 15GS, silicon manganese copper - 10G2SD(MK), chrome silicon manganese 14KhGS, manganese - 19G manganese nickel - 14GN, etc. (G - manganese; Kh - chromium; N - nickel; D - copper).

The mechanical properties and the chemical composition of the used for manufacture tubes of the mark/brands of steels according to GOST 1050-60 and GOST 5058-57* must correspond to the norms, given in Table 2.4 and 2.5.

Steel carbon of usual quality according to GOST 380-60 is manufactured in open-hearth furnaces (killed, rimmed, semi-killed) and in Bessemer converters (killed, rimmed).

Table 2.3. Application/use of tubes dePending on the operational characteristics of heat carrier and mark/brands of steel.

(1) Марка стали: ГОСТ	(2) Вид труб	(3) ГОСТ или ТУ на изготовление труб	(4) Температура среды t в °С, не выше	(5) Давление среды (условное P_y и рабочее $P_{раб}$) в кгс/см²
ГОСТ 380–60	(6) обыкновенные	ГОСТ 3262–62	150	$P_y \leq 10$
(7) Ст. 2, Ст. 3; ГОСТ 380–60; (8) Группа А	Сварные мягкие	ГОСТ 1753–53	200	$P_y \leq 16$
10, 20; ГОСТ 1050–60	То же (10)	ГОСТ 1753–53	300	$P_y \leq 16$
(11) ВСт. 2 кп; подгруппа В ГОСТ 380–60	Сварные со спиральным швом (12)	ГОСТ 8696–62, (13) группа А	200	$P_y \leq 16$
(14) ВСт.3, Ст.2 и Ст.3; группа А и подгруппа В ГОСТ 380–60	То же (10)	ГОСТ 8696–62, (15) группы А и В	300	$P_y \leq 25$
10Г2 СД (МК); ГОСТ 5058–57*	•	ГОСТ 8696–62, (15) группы А и В	350	$P_y \leq 25$
(16) ВСт.2кп, ВСт. 3кп; подгруппа В, ГОСТ 380–60	Сварные с продольным швом* (17)	ГОСТ 4015–58, группа А	200	$P_y \leq 16$
(18) Ст.2, Ст.3, ВСт.3; группа А и подгруппа В ГОСТ 380–60	То же с двухсторонним швом* (19)	ГОСТ 4015-58, (7) группа А	300	$P_y \leq 25$
10Г2СД (МК), 14ХГС; ГОСТ 5058–57*	Сварные с продольным швом (6)	ЧМТУ Укр. НИТИ (20) 182–60	400	$P_{раб} \leq 21$
14ГН, 19Г; 16ГН, 17ГС ГОСТ 5058–57*	•	ЧМТУ Укр. НИТИ (20) 450–63	300	$P_{раб} \leq 16$
(17) Ст. 3, группа А, ГОСТ 380–60	•	ТУ 06–56	300	$P_{раб} \leq 16$
Ст.2, Ст.3; ГОСТ 380–60	(21) Бесшовные	ГОСТ 8731–58*, ГОСТ 8733–58*	300	$P_{раб} \leq 22$
10, 20; ГОСТ 1050–60	То же (10)	ГОСТ 8731–58* ГОСТ 8733–58*	(22) Пар перегретый	
			450	$P_{раб} \leq 60$
			470	$P_{раб} \leq 16$
			(23) Пар насыщенный, горячая вода	
			300	$P_{раб} \leq 80$

Note. For thermal grid/networks in northern areas, are recommended the applying of tubes made of steel of brand 20 according to GOST 1050-6 or made of killed steel of subgroup V of brand VSt. 3 according to GOST 380-60. The

last/latter mark/brand of steel it is allow/assumed to apply at the temperatures of heat carrier not above 300°C.

Key: (1). Trademark of steel. (2). Form of tubes. (3). GOST or TU [Technical Specifications] for the manufacture of tubes. (4). The temperature of medium t in °C, is not above. (5). The pressure of medium (conditional P_y and working $P_{раб}$) in kg/cm². (6). usual. (7). St. (8). Groups. (9). Welded soft. (10). The same. (11). VSt. 2kp; subgroup. (12). Welded with spiral weld. (13). VSt. 3, St. 2 and St. 3; group A and subgroup V. (14). and. (15). VSt. 2kp; VSt. 3kp; subgroup. (16). Welded with longitudinal weld [2].

FOOTNOTE [2]. Is allow/assumed application/use of St. 2kp and St. 3kp with limitation by the chemical composition with t $\leq$ 150°C. END FOOTNOTE.

(17). Group. (18). St. 2, St. 3, VSt. 3; group A and subgroup. (19). The same with bilateral weld [1].

FOOTNOTE [1]. With one-way weld $P_{y<16}$ kgf/cm². ENDFOOTNOTE.

(20). Ukrainian. (21). Seamless. (22). Overheated vapor. (23). Saturated vapor, hot water.

Page 19.

Depending on designation/purpose and the guaranteed characteristics, steel is subdivided into two groups into one subgroup:

group A is supplied on mechanical properties of brands st. 2, st. 3, etc.;

group B is supplied by the chemical composition of brands MSt. 2kp, MSt. 3kp. MSt. 3 etc. (open-hearth) and BSt 3kp, BSt 3, etc. (Bessemer);

subgroup V is supplied according to mechanical properties and with additional by requirements with respect to the chemical composition of brands VSt. 2kp, VSt. 3kp, VSt. 3, etc. (is manufactured only with Martin method).

For steel of group A according to GOST 380-60 guaranteed characteristics are the tensile strength and elongation per unit length (see Table 2.4), the chemical composition of steel is indicated in certificate, but deviations from norms with respect to the chemical composition sorting sign/criterion are not; for steel of group B the guaranteed characteristic is the chemical composition (see Table 2-5); for steel of subgroup V the guaranteed characteristics they are:

yield point, tensile strength and elongation per unit length in accordance with the norms of Table 2.4;

the upper limits of the carbon content, sulfur and phosphorus, and also silicon (for killed and semi-killed steel) in accordance with the norms of Table 2.5;

the maximum content of chromium, nickel and copper - are not more than 0.3o/o (each cell/element).

According to GOST 380-60 and GOST 1050-60 mark/brands of rimmed steel, they have an index "kp", and semikilled "ps".

In accordance with the rules of Gosgortekhnadzor tubes must be made of steel, smelted by Martin method or in electric furnaces.

2.2. Assortment of the tubes of thermal grid/networks.

By All-Union state design institute Teploelektroproyekt in 1959 is developed the assortment of the tubes of thermal grid/networks, in which are given outside diameters and the wall thicknesses of tubes depending on the method of the packing of thermal grid/networks and parameters of heat carriers (Table 2.6 and 2.7).

Table 2.4. Mechanical properties of steel according to GOST 1050-60, GOST 380-60 and GOST 5058-57*.

(1) ГОСТ; марка стали	(2) Толщина проката в мм	(8) Предел текучести в кгс/мм²	(9) Относительное удлинение в %		(5) Временное сопротивление разрыву в кгс/мм²	(6) Относительное сужение в %	(7) Испытание на загиб на 180° в холодном состоянии (s — толщина образца; d — диаметр оправки; c — толщина оправки; a — толщина проката)
			10	5			
		*(8) не менее					
ГОСТ 380—60; Ст.2, Ст.2кп (9) (10)	(11) Сортовая сталь — до 10 вкл. (12) Фасонная — до 15 вкл. (13) Широкополосная — от 4 до 20 вкл.	22	26	31	34—42	—	$d = 0$
ГОСТ 380—60; Ст.3, Ст. 3кп (9) (10)		24	23	27	38—40	—	$d = 0{,}5s$
			22	26	41—43	—	$d = 0.5s$
			21	25	44—47	—	$d = 0.5s$
ГОСТ 1050—60; 10кп (10)	(14) До 80	19	—	33	32	55	—
ГОСТ 1050—60; 10		21	—	31	34	55	
ГОСТ 1050—60; 20кп (10)	(14) До 80	23	—	27	39	55	—
ГОСТ 1050—60; 20		25	—	25	42	55	
ГОСТ 5058-57*; 10Г2СД (МК)	4—32	35	18	—	50	—	$c = 2a$
ГОСТ 5058—57*; 14ХГС	4—10	35	18	—	50	—	$c = 2a$
	11—20	34					
14ГН	4—10	34	18	—	48	—	$c = 2a$
ГОСТ 5058—57*; 19Г	4—10	30	18	—	47	—	$c = 2a$
ГОСТ 5058—57*; 15ГС	4—10	35	18	—	50	—	$c = 2a$
	11—20	34	18	—	48	—	$c = 2a$

Notes: 1. On client's requirement, stipulated in order, is supplied steel of brands st. 3 and st. 3 kp. according to GOST 380-60 by thickness to 20 mm with flanging test in cold state to the contact of sides.

2. For mark/brands of steel according to GOST 380-60, is allow/assumed increase in tensile strength by 3 kg/mm²

from upper limit, and with client's agreement - without limitation of upper limit with satisfactory results of flanging tests in accordance with norms of table (in both cases).

Key: (1). trademark of steel. (2). Thickness of rolled stock in mm. (3). Yield point in kgf/mm². (4). Elongation per unit length in o/o. (5). temporary tensile strength in kgf/mm². (6). Relative reduction of area in o/o. (7). Flanging test for 180° in cold state (s is thickness of specimen/sample; d - the diameter of mandrel/mount; c is a thickness of mandrel/mount; a is a thickness of rolled stock). (8). it is not less. (9). St. (10). kp. (11). Section steel - to 40 on. (12). Shaped - to 15 on. (13). Broadband is from 4 to 20 on. (14). To.

Page 20.

The minimum wall thicknesses of tubes in assortment correspond to the minimum wall thicknesses of tubes according to the effective Gosts or on the commercial assortment of the tubes, produced by Soviet plants. Further decrease in the wall thicknesses of tubes for the low

parameters of heat carriers is possible and must be realize/accomplished with mastery/adoption by industry of the issue of more thin-walled tubes.

Table 2.5. The chemical composition of steel and manufacturing tolerances according to GOST 1050-60, GOST 380-60 and GOST 5058-57*.

(1) ГОСТ, марка стали	(2) Химический состав стали в %								
	(3) углерод	(4) кремний	(5) марганец	(6) фосфор	(7) сера	(8) хром	(9) никель	(10) медь	(11) мышьяк
	не более								
ГОСТ 380—60, (12) (13) МСт. 2кп	0,09—0,15	(14) Не более 0,07	0,25—0,5	0,045	0,055	0,3*	0,3*	0,3*	0,08
ГОСТ 380—60, (12) (13) МСт. 3кп	0,14—0,22	то же (15)	0,3—0,6	0,045	0,055	0,3*	0,3*	0,3*	0,08
ГОСТ 380—60, (12) МСт. 3	0,14—0,22	0,12—0,3	0,4—0,65	0,045	0,055	0,3*	0,3*	0,3*	0,08
ГОСТ 1050—60, 10кп (13)	0,07—0,14	Не более (14) 0,07	0,25—0,5	0,04	0,04	0,15	0,25	0,25	0,08
ГОСТ 1050—60, 10	0,07—0,14	0,17—0,37	0,35—0,65	0,035	0,04	0,15	0,25	0,25	0,08
ГОСТ 1050—60, 20кп (13)	0,17—0,24	Не более 0,07	0,25—0,5	0,04	0,04	0,25	0,25	0,25	0,08
ГОСТ 1050—60, 20	0,17—0,24	0,17—0,37	0,35—0,65	0,04	0,04	0,25	0,25	0,25	0,08
ГОСТ 5058—57*, 10Г2СД (МК)	≤0,12	0,8—1,1	1,3—1,65	0,04	0,04	0,3	0,3	0,15—0,3	—
ГОСТ 5058—57*, 14ХГС	0,11—0,17	0,40—0,7	0,9—1,3	0,04	0,04	0,5—0,8	0,3	0,3	—
14ГН	0,11—0,16	0,2—0,4	0,75—1,1	0,04	0,04	0,3	0,5—0,8	0,3	—
ГОСТ 5058—57*, 19Г	0,16—0,22	0,2—0,4	0,7—1	0,04	0,04	0,3	0,3	0,3	—
ГОСТ 5058—57*, 15ГС	0,12—0,18	0,7—1	0,9—1,3	0,04	0,04	0,3	0,3	0,3	—
	(16) допускаемые отклонения в %								
ГОСТ 380—60, (17) спокойная	+0,03 −0,02	+0,03 −0,02	+0,05 −0,03	+0,005	+0,005	—	—	—	—
ГОСТ 380—60, (18) кипящая	±0,03	—	+0,05 −0,04	+0,006	+0,006	—	—	—	—
ГОСТ 5058—57*	±0,02	±0,03	±0,1	+0,005	+0,005	±0,5	±0,5	±0,5	—

Notes: 1. By chain wheel is marked the content of the cell/elements, guaranteed on client's requirement.

2. On client's requirement, are allow/assumed additional deviations and limitations by chemical composition of steel on by those corresponding to Gosts to steel.

Key: (1). trademark of steel. (2). The chemical composition of steel in o/o. (3). carbon. (4). silicon. (5). manganese.

(6). phosphorus. (7). sulfur. (8). chromium. (9). nickel. (10). copper. (11). arsenic. (12). MSt. (13). kp. (14). It is not more. (15). the same. (16). manufacturing tolerances to o/o. (17). steady. (18). boiling.

Table 2.6. The assortment of the tubes of thermal grid/networks for above-ground and underground laying according to MVN 1225-59; MVN 1233-59; MVN 1234-59.

(4) ГОСТ на трубы	(5) Условный проход D_y в мм	(6) Наружный диаметр $D_н$ в мм	(1) Толщина стенок труб в мм при рабочих параметрах теплоносителя: $P_{раб}$ кг/см², t °С				
			(2) для трубопроводов				(3) для соединения с плоскими приварными фланцами по ГОСТ 1255–54*
			$P_{раб}$=8, t=100; $P_{раб}$=8, t=250	$P_{раб}$=16, t=150; $P_{раб}$=13, t=300	$P_{раб}$=16, t=325; $P_{раб}$=21, t=350	$P_{раб}$=36, t=425	$P_{раб}$=8, t=100; $P_{раб}$=8, t=250; $P_{раб}$=13, t=300; $P_{раб}$=16, t=150; $P_{раб}$=16, t=325;
8732–58*	25¹	32	2,5	2,5	2,5	2,5	3,5
	32¹	38	2,5	2,5	2,5	2,5	3,5
	40¹	45	2,5	2,5	2,5	2,5	3,5
	50	57	3,5	3,5	3,5	3,5	3,5
	70	76	3,5	3,5	3,5	3,5	4
	80	89	3,5	3,5	3,5	3,5	4
	100	108	4	4	4	4	4
	125	133	4	4	4	4	4
8732–58*	150	159	4,5	4,5	4,5	4,5	4,5
	175	194	5²	5²	5²	5²	6
	200	219	6	6	6	6	6
	250	273	7	7	7	7	8
	300	325	8	8	8	9	8
	350	377	9	9	9	10	9
	400	426	—	—	9²	11	9²
4015–58	450	426	6²	6²/7	—	—	9
	450	478	6²	6²/7	—	—	9
	500	529	6²	6²/7	—	—	9
	600	630	7	7/8	—	—	9
	700	720	7²	7²/8	—	—	—
	800	820	8	8/9	—	—	—
	900	920	9	9/10	—	—	—
	1000	1020	10	10/11	—	—	—
8696–62	400	426	6¹	6¹	—	—	9¹
	450	480	6¹	6¹	—	—	9¹
	500	530	6²	6²	—	—	9
	600	630	7	8	—	—	9
	700	720	7	7	—	—	—

Notes: 1. In the denominator of fraction, is given the wall thickness of tubes with channel-free laying of pipelines with $P_{раб}=16$: t = 150 and $P_{раб}=8$: t = 100.

2. Tubes, marked[1], can be applied cold-drawn and cold-rolled according to GOST 8734-58.

3. Tubes, marked[2], to issue with their industry it should be accepted size/dimensions 194 x 6 and 426 x 10 mm.

4. Tubes, marke[3], to issue by their industry one should accept size/dimensions 426 x 7; 478 x 7; 480 x 7; 530 x 7; 529 x 7; 720 x 8 mm.

5. Tubes, marked[4], as size/dimensions 426 x 9 and 478 x 9 are received about GOST 4015-58.

Key: (1). The wall thickness of tubes in mm in the operational characteristics of the heat carrier: $P_{раб}$ in kg/cm^2, t in °C. (2). for pipelines. (3). for connection with flat/plane welded flanges according to GOST. (4). GOST for tubes. (5). The internal diameter D_y in mm. (6). Outside diameter $D_н$ in mm.

Table 2.7. Assortment of the tubes of thermal grid/networks (limits of application/use and mark/brand of steel).

(1) ГОСТ на трубы	(2) Прокладка трубопроводов	(3) Рабочие параметры теплоносителя		ГОСТ; марка стали (6)
		(4) давление $P_{раб}$ в кгс/см²	(5) температура t °C	
8732—58*; 4015—58	(7) Надземная, в непроходных каналах, тоннелях и бескамальная	8	100	ГОСТ 380—60; (9) Ст. 3
		16	150	
8732—58*	(8) Надземная, в непроходных каналах и тоннелях	8	250	
		13	300	
		16	325	ГОСТ (10) 1050—60; сталь 20
		21	350	
8732—58*	(8) Надземная, в непроходных каналах и тоннелях	36	425	ГОСТ 1050—60; (10) сталь 20
~~8696—62~~		8	100	ГОСТ 380—60, (9) Ст. 3
		16	150	
		8	250	
		13	300	

Note. For tubes according to GOST 8732-58*, is allow/assumed the replacement of the mark/brands of steel of tubes without a change in the wall thickness and without testing by calculation for the strength of steel 20 and of st. 3 for steel 10 for heat carriers $P_{раб} < 21$ kg/cm², t ≤

350°C with above-grade packing and in channels and steel st. 3 for steel 10 or on st. 2 for heat carriers $P_{раб} < 14$ kg/cm², t ≤ 150°C with channel-free packing. With other mark/brands of steel, is performed the calculation.

Key: (1). GOST to tubes. (2). Pipe laying. (3). The operational characteristics of heat carrier. (4). pressure $P_{раб}$ in kg/cm². (5). the temperature t in °C. (6). GOST; trademark of steel. (7). Above-grade, in impassable channels, tunnels is channel-free. (8). Above-grade, in impassable channels and tunnels. (9). St. (10). steel.

Page 22.

The reserve in the wall thickness of tubes for corrosion during the compilation of assortment was not considered.

The typical dimensions of the used in thermal grid/networks steel light/lung water-gas conducting tubes (gas) according to GOST 3262-62 and electric welding according to GOST 1753-53 are given in Table 2.8.

The wall thickness of tubes for welding of flat/plane

flanges must be not lower than established/installed GOST 1255-54* to flat/plane welded flanges. If the wall thickness of tubes for welding of flat/plane flanges is more than the wall thickness of the tubes of basic pipeline, are provided for the thickened tubes in the form of branch connections by length not less than 500 mm, welded into joint to the combinable ends of the pipeline.

Besides the tubes, used for the construction of the basic pipelines of the thermal grid/networks, given above, are applied small-diameter tubes for the manufacture of the branches of air-escape cocks and drains, for the brace of condensation traps and drainage controllers and others.

For this purpose, just as for basic pipelines, can be applied the seamless cold-drawn and hot-rolled tubes according to GOST 8734-58 and GOST 8732-58*, water-gas conducting light according to GOST 3262-62 and electric welding according to GOST 1753-53.

The wall thicknesses of tubes by internal diameter 15 and 20 mm, not provided for by assortment, are given in Table 2.9, but for the remaining diameters of tubes, are applied wall thicknesses, indicated in Table 2.6 and 2.8,

in this case light/lung water-gas conducting tubes can be applied in the parameters of heat carrier $P_y \leq 16$ kg/cm², t $\leq$ 200°C.

During the compilation of specifications to tubes, one should consider that some point/items of technical specifications for the manufacture of tubes are fulfilled only in such a case, when they are stipulated in specification.

According to GOST 8731-58* and GOST 8733-58*, must be supplied the tubes with guarantee on mechanical properties and hydraulic test. Tubes for the parameters of heat carrier $P_{gas} < 22$ kg/cm², t < 300°C must be supplied with the limitation of the content of sulfur to 0.055o/o and phosphorus to 0.050o/o; tubes for the parameters of heat carrier $P_{gas} \geq 22$ kg/cm², 300°C $\leq$ t $\leq$ 375°C must pass flattening tests, and with $P_y \geq 25$ kg/cm², t $\geq$ 375°C - for macrostructure, distribution and flattening (paragraphs 8, 20 21 GOST 8731-58* and GOST 8733-58*);

according to GOST 4015-58 must be supplied the tubes of group A. For the parameters of heat carriers 16 kg/cm² $\leq P_y \leq$ 25 kg/cm²; 200°C < t < 300°C must be supplied

tubes with one longitudinal seam with its bilateral penetration and control/check to by 100o/o fluoroscopy or UZD. Hydraulic test of tubes must be produced when $P_{np} \geq 1.5\ P_y$;

according to GOST 8696-62 must be supplied the tubes of groups A and B depending on the parameters of heat carrier (see Table 2.3). Hydraulic test of tubes must be produced when $P_{np} \geq 1.5\ P_v$;

according to GOST 3262-62 and GOST of 1753-53 tubes with the internal diameter $D_y \geq 20$ mm must have the height of burr or its traces not more than 0.5 mm (p. of 10 GOST 3262-62 and GOST 1753-53). Water-gas conducting tubes, furthermore, they must test for knee (p. of 14 GOST 3262-62). Hydraulic test of tubes according to GOST 1753-53 must be produced when $P_{np} \geq 1.5\ P_y$;

the ends of the tubes according to all Gosts must be bevelled (is removed facet/bevel): for tubes according to GOST 8731-58*, GOST 8733-58* (p. 3), GOST 4015-58 (p. 12), GOST 1753-53 for $D_n \geq 114$ mm (p. 11) - at an angle of 35-40° toward the end of the tube, according to GOST 3262-62 for $D_y \geq 70$ mm the value of the rake angle is not specified.

During accomplishing of the taper of ends, must be left end ring by width 1-3 mm.

With the order of tubes in specifications must be shown working parameters of heat carrier.

2.3. Basic typical dimensions of tubes.

The basic dimensions of tubes are given in Table 2.10-2.14.

Basic dimensions of light/lung water-gas conducting tube according to GOST 3262-62 are given in Table 2.15.

Table 2.8. Tubes, electric-welding and water-gas conducting.

(4) Условный проход D_y в мм	(1) Трубы электросварные миские по ГОСТ 1753—53 и по МН 2366—61			(2) Трубы водогазопроводные (газовые) легкие, неоцинкованные по ГОСТ 3262—62		
	(5) наружный диаметр $D_н$ в мм	(6) Толщина стенки трубы: для трубопроводов	(7) для соединений с плоскими приварными фланцами по ГОСТ 1255—54*	(5) наружный диаметр $D_н$ в мм	(8) Толщина стенки в мм	(9) вес 1 м трубы без муфты (неоцинкованной) в кг
25	32	2	3	33.5	2.8	2.12
32	38	2	3	42.3	2.8	2.73
40	44.5	2.5	3	48	3	3.33
50	57	3	3.5	60	3	4.22
70	76	3	4	75.5	3.2	5.71
80	89	3	4	88.5	3.5	7.34
100	108	3	4	114	4	10.85
125	133	3.5	4	140	4	15.04

Notes: 1. The application/use of tubes according to GOST 3262-62 and GOST 1753-53 depending on the operational characteristics of heat carrier and the mark/brands of steel see in Table 2.3.

2. Tubes according to GOST 3262-62 and GOST 1753-53 are applied with all methods of packing of thermal grid/networks, except channel-free, if height/altitude of flash or its traces does not exceed 0.5 mm.

3. Tubes are applied common manufacturing precision.

4. Zinc-coated tubes according to GOST 3262-62 heavier than ungalvanized by 3-4o/o.

Key: (1). Tubes electric welding soft according to GOST 1753-53 and on MN 2566-61. (2). Tubes water-gas conducting (gas) light/lungs, not galvanized according to GOST 3262-62. (3). the wall thickness of tube. (4). The internal diameter in (D_y) mm. (5). Outside diameter D_H in mm. (6). for pipelines (7). for connection with flat/plane welded flanges according to GOST 1255-54 *. (8). wall thickness in mm. (9). weight 1 m of tube without sleeve (not galvanized) in kg.

Table 2.9. Tubes by internal diameter 15 and 20 mm.

(1) Условный проход D_y в мм	(4) Наружный диаметр $D_н$ в мм	(3) Толщина стенки в мм	(9) Вес 1 м трубы в кг	(5) ГОСТ на трубы	(6) ГОСТ, марка стали
15	21.3	2,5	1.16	(7) 3262—62 легкие нелощинованные	ГОСТ 380—60; (8) Ст. 3
20	26.8	2,5	1.5		
15	18	2	0.789	1753—53 мягкие	ГОСТ 1050—60; 10,20 ГОСТ 380—60, (8) Ст. 3
20	25	2	1.13		
15	18	2	0.789	8734—58	ГОСТ 1050—60; 10,20 ГОСТ 380—60; (8) Ст. 3;
		3*	1.11		
20	25	2	1.13	8734—58	
		3*	1.63	(10) 8734—58 или 8732—58*	

Note. By asterisk is noted the wall thickness of tubes, which one should apply for welding of flat/plane flanges according to GOST 1255-54 *.

Key: (1). The internal diameter D_Y in mm. (2). Outside diameter D_H in mm. (3). Wall thickness in mm. (4). Weight 1 m of tube in kg. (5). GOST to tubes. (6). GOST; trademark of steel. (7). light/lung not galvanized. (8). St (9). Soft. (10). or.

page 23.

Table 2.10. Basic dimensions of tubes.

(1) Условный проход D_y в мм	(2) Наружный диаметр $D_н$ в мм	(3) Толщина стенки в мм		(4) Внутренний диаметр в мм		(5) Площадь в $см^2$ $F_в$ по $D_в$	(6) Площадь поперечного сечения стенки трубы в $см^2$		(7) Момент сопротивления поперечного сечения трубы в $см^3$		(8) Момент инерции поперечного сечения трубы в $см^4$	
		(9) номинальная s	(10) расчетная $s^р$	(11) $D_в$ при s	$D_в^р$ при $s^р$		(i) f при s	(ii) $f^р$ при $s^р$	(i) W при s	(ii) $W^р$ при $s^р$	(i) J при s	(ii) $J^р$ при $s^р$
25	32	2,5	2	27	28	5,73	2,31	1,88	1,59	1,33	2,54	2,13
32	38	2,5	2	33	34	8,55	2,79	2,26	2,32	1,93	4 41	3,68
40	45	2,5	2	40	41	12,57	3,30	2,7	3,36	2,78	7,56	6,25
50	57	3,5	2,97	50	51,06	19,63	5,92	5,04	7,42	6,46	21,1	18,4
70	76	3,5	2,97	69	70,06	37,39	7,96	6,81	13,8	11,96	52,5	45,5
80	89	3,5	2,97	82	83,06	52,81	9,41	8,02	19,3	16,8	86,1	74,7
100	108	4	3,4	100	101,2	78,54	13,11	11,17	32,8	28,3	177	153
125	133	4	3,4	125	126,2	122,7	16,2	13,8	50,8	43,3	338	291
150	159	4,5	3,82	150	151	176,7	21,9	18,5	82	70,5	652	561
175	194	5	4,25	184	185,5	265,9	29,7	25,3	137	118	1 327	1 140
200	219	6	5,1	207	208,8	336,5	40,2	34,2	208	119	2 279	1 960
250	273	7	5,95	259	261,1	526,9	58,4	49,9	379	326	5 177	4 470
300	325	8	6,8	309	311,4	749,9	79,7	68	616	529	10 014	8 600
		9	7,65	307	309,7	740,2	89,4	76,3	687	591	11 161	9 600
350	377	9	7,65	359	361,7	1012	104	89	935	803	17 624	15 140
		10	8,5	357	360	1001	115	98	1031	886	19 426	16 700
400	426	9	7,65	408	410,7	1307	118	100	1204	1032	25 640	21 990
		11	9,35	404	407,3	1282	143	122	1451	1247	30 896	26 550
450	478	6	5,4	414	415,2	1346	79	71	820	741	17 460	15 760
		6	5,4	466	467,2	1706	89	81	1037	936	24 760	22 370
500	529	6	5,4	517	518,2	2099	99	89	1275	1150	33 711	30 420
		7	6,4	515	516,2	2083	115	105	1479	1356	39 160	35 850
600	630	7	6,4	616	617,2	2980	137	125	2110	1934	66 478	60 920
		8	7,2	614	615,6	2961	156	139	2400	2167	75 612	68 270
700	720	7	6,4	706	707,2	3915	157	144	2768	2536	99 648	91 290
		9	8,2	702	703,6	3870	202	183	3529	3224	127 052	116 360
800	820	8	7,2	804	805,6	5077	204	184	4103	3701	168 213	151 700
900	920	9	8,2	902	903,6	6390	258	235	5810	5304	267 239	244 000
1000	1020	10	9,2	1000	1001,6	7854	317	292	7934	7313	404 638	372 900

Note. By bold line is designated the boundary/interface between seamless and wrought pipes.

Key: (1). the internal diameter D_y in mm. (2). Outside diameter $D_н$ in mm. (3). Wall thickness in mm. (4). Bore in mm. (5). Area in cm² $f_п$ on $D_в$ (6). Cross-sectional area of the wall of tube in cm². (7). Moment of resistance of the cross section of tube in cm³. (8). Moment of the inertia of the cross section of tube in cm⁴. (9). nominal. (10). calculated. (11). with.

Pages 24-25.

Table 2.11. Weight 1 m of tube $q_{тр}$ in kg.

(1) Условный проход трубы D_y в мм	(2) Наружный диаметр трубы $D_н$ в мм	(3) $q_{тр}$ при толщине стенки трубы s в мм											
		1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	
15	18	0,61	0,789	0,956	1,11	1,25	1,38	1,5	1,6	—	—	—	
20	25	0,869	1,13	1,39	1,63	1,86	2,07	2 28	2,47	2,64	2,81	2,97	
25	32	1,13	1,48	1,78	2,15	2,46	2,76	3,05	3,33	3,59	3,85	4,09	
32	38	1,35	1,78	2,19	2,59	2,96	3,35	3,72	4 07	4,41	4,74	5,05	
40	45	1,61	2,12	2,62	3,11	3,58	4,04	4,49	4,93	5,36	5,77	6,17	
50	57	2,05	2,71	3,36	4	4,62	5,23	5,83	6,41	6,99	7,55	8,1	
70	76	2,76	3,65	4,53	5,4	6,26	7,1	7,93	8,75	9,5	10,36	11,14	
80	89	3,24	4,29	5,33	6,36	7,36	8,38	9,38	10,36	11,33	12,28	13,22	
100	108	3,95	5,23	6,5	7,77	9,02	10,26	11,49	12,7	13,9	15,09	16,27	
125	133	—	—	8,05	9,59	11,18	12,73	14,26	15,78	17,29	18,79	20,29	
150	159	—	—	—	—	—	—	17,15	18,99	20,82	22,64	24,45	
175	194	—	—	—	—	—	—	—	23,31	25,6	27,82	30	
200	219	—	—	—	—	—	—	—	—	—	31,52	34,06	
250	273	—	—	—	—	—	—	—	—	—	—	42,64	
300	325	—	—	—	—	—	—	—	—	—	—	—	
350	377	—	—	—	—	—	—	—	—	—	—	—	
400	426	—	—	—	—	—	41,63	46,78	51,91	—	62,15	—	
450	478	—	—	—	—	—	46,76	52,55	58,33	—	69,84	—	
500	529	—	—	—	—	—	51,79	58,21	64,61	—	77,39	—	
600	630	—	—	—	—	—	61,75	69,42	77,07	—	92,33	—	
700	720	—	—	—	—	—	—	—	88,17	—	105,7	—	
800	820	—	—	—	—	—	—	—	100,5	—	120,5	—	
900	920	—	—	—	—	—	—	—	112,8	—	135,2	—	
1000	1020	—	—	—	—	—	—	—	125,2	—	150	—	
1200	1220	—	—	—	—	—	—	—	—	—	—	—	

③ $q_{тр}$ при толщине стенки трубы s в мм												
7	7,5	8	8,5	9	9,5	10	11	12	13	14	15	16
—	—	—	—	—	—	—	—	—	—	—	—	—
3,11	—	—	—	—	—	—	—	—	—	—	—	—
4,32	4,53	4,74	—	—	—	—	—	—	—	—	—	—
5,35	5,64	5,92	—	—	—	—	—	—	—	—	—	—
6,56	6,94	7,3	7,65	7,99	8,32	8,63	—	—	—	—	—	—
8,63	9,16	9,67	10,17	10,65	11,13	11,59	12,48	13,32	14,11	—	—	—
11,91	12,67	13,42	14,15	14,87	15,58	16,28	17,63	18,94	20,2	21,41	22,57	25,68
14,16	15,07	15,98	16,87	17,76	18,63	19,48	21,16	22,79	24,37	25,89	27,37	28,8
17,44	18,59	19,73	20,86	21,97	23,08	24,17	26,31	28,41	30,46	32,45	34,4	36,3
21,75	23,21	24,66	26,10	27,52	28,93	30,33	33,10	35,81	38,41	41	43,65	46,17
26,24	28,02	29,79	31,55	33,29	35,03	36,75	40,15	43,5	46,81	50,06	53,27	56,43
32,28	34,5	36,7	38,89	41,06	43,23	45,38	49,64	53,86	58,03	62,15	66,22	70,24
36,6	39,12	41,63	44,12	46,61	49,08	51,54	56,43	61,26	66,04	70,78	75,46	80,1
45,92	49,1	52,28	55,45	58,6	61,73	64,86	71,07	77,24	83,36	89,42	95,44	101,41
—	58,74	62,54	66,35	70,14	73,92	77,68	85,18	92,63	100,03	107,38	114,68	121,93
—	—	—	—	81,68	86,1	90,51	99,29	108,02	117	125,33	133,91	142,14
72,33	—	82,47	—	92,56	97,57	102,6	112,6	122,52	132,41	142,25	152,04	161,78
81,31	—	92,73	—	104,1	—	115,4	126,7	137,9	—	—	—	—
90,11	—	102,9	—	115,4	—	128	140,5	153	—	—	—	—
107,5	—	122,7	—	137,8	—	152,9	167,9	182,9	—	—	—	—
123,1	—	140,5	—	157,8	—	175,1	192,3	209,5	—	—	—	—
140,3	—	160,2	—	180	—	199,8	219,5	239,1	258,7	278,3	297,8	317,3
157,6	—	179,9	—	202,2	—	224,4	246,6	268,7	290,8	312,8	334,8	356,7
174,9	—	199,7	—	224,4	—	249,1	273,7	298,3	322,8	347,3	371,8	396,2
210	—	239	—	268	—	298	328	358	387	416	446	475

Note. The weight of tubes taking into account weld reinforcement is accepted: for tubes with the longitudinal seam D_y 400-1200 mm to 1o/o, but with spiral weld - to 1.5o/o more than theoretical weight of tubes, indicated in table.

Key: (1). The internal diameter of tube D_y in mm. (2). Outside diameter of tube $D_н$ in mm. (3). $q_{тр}$ with the wall thickness of tube s in mm.

Table 2.12. Weight of water 1 m of tube $q_в$ in kg.

Table 2-12.

(1) Наружный диаметр трубы $D_н$ в мм	(2) $q_в$ при толщине стенки трубы s в мм										
	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6	6,5
18	0,177	0,154	0,133	0,113	0,095	0,079	0,063	0,05	—	—	—
25	0,38	0,346	0,314	0,284	0,255	0,227	0,201	0,177	0,154	0,133	0,113
32	0,661	0,616	0,573	0,531	0,491	0,452	0,416	0,38	0,346	0,314	0,284
38	0,962	0,908	0,855	0,804	0,755	0,707	0,661	0,619	0,573	0,531	0,491
45	1,39	,32	1,26	1,2	1,13	1,08	1,02	0,962	0,908	0,855	0,804
57	2,29	2,21	2,12	2,04	1,96	1,89	1,81	1,74	1,66	1,59	1,52
76	4,19	4,07	3,96	3,85	3,74	3,63	3,53	3,42	3,32	3,22	3,12
89	5,81	5,68	5,54	5,41	5,28	5,15	5,03	4,9	4,78	4,66	4,54
108	8,66	8,5	8,33	8,17	8,01	7,85	7,7	7,54	7,39	7,24	7,09
133	—	—	12,87	12,67	12,47	12,27	12,08	11,88	11,69	11,5	11,31
159	—	—	—	—	—	—	17,67	17,44	17,2	16,97	16,74
194	—	—	—	—	—	—	—	26,59	26,3	26,02	25,73
219	—	—	—	—	—	—	—	—	—	33,85	33,33
273	—	—	—	—	—	—	—	—	—	—	53,09
325	—	—	—	—	—	—	—	—	—	—	—
377	—	—	—	—	—	—	—	—	—	—	—
426	—	—	—	—	—	137,2	136,6	135,9	—	134,6	—
478	—	—	—	—	—	173,5	172,8	172	—	170,6	—
529	—	—	—	—	—	213,2	212,4	211,6	—	209,9	—
630	—	—	—	—	—	303,9	302,9	301,9	—	300	—
720	—	—	—	—	—	—	—	395,9	—	393,7	—
820	—	—	—	—	—	—	—	515,3	—	512,8	—
920	—	—	—	—	—	—	—	650,4	—	647,5	—
1020	—	—	—	—	—	—	—	801,2	—	798	—
1200	—	—	—	—	—	—	—	—	—	—	—

(2) $q_в$ при толщине стенки трубы s в мм												
7	7,5	8	8,5	9	9,5	10	11	12	13	14	15	16
—	—	—	—	—	—	—	—	—	—	—	—	—
0,095	—	—	—	—	—	—	—	—	—	—	—	—
0,255	0,227	0,201	—	—	—	—	—	—	—	—	—	—
0,452	0,416	0,38	—	—	—	—	—	—	—	—	—	—
0,755	0,707	0,661	0,616	0,573	0,531	0,491	—	—	—	—	—	—
1,45	1,39	1,32	1,28	1,2	1,13	1,08	0,962	0,855	0,755	—	—	—
3,02	2,92	2,83	2,73	2,64	2,55	2,46	2,29	2,12	1,96	1,81	1,66	1,52
4,42	4,3	4,19	4,07	3,96	3,85	3,74	3,53	3,32	3,12	2,92	2,73	2,55
6,94	6,79	6,65	6,50	6,36	6,22	6,08	5,81	5,54	5,28	5,03	4,78	4,54
11,12	10,94	10,75	10,57	10,39	10 21	10,03	9,68	9,33	8,99	8,66	8,33	8,01
16,51	16,29	16,06	15,84	15,61	15,39	15,17	14,74	14,31	13,89	13,48	13,07	12,67
25,45	25,16	24,88	24,61	24,33	24,05	23,78	23,24	22,7	22,17	21,64	21,12	20,61
33,01	32,69	32,37	32,05	31,73	31,42	31,1	30,48	29,86	29,26	28,65	28,06	27,46
52,69	52,28	51,87	51,47	51,07	50,67	50,27	49,48	48,7	47,92	47,14	46,38	45,62
—	75,48	74,99	74,51	74,02	73,54	73,06	72,11	71,16	70,22	69,28	68,35	67,43
—	—	—	—	101,2	100,7	100,1	98,98	97,87	96,76	95,66	94,57	93,48
133,3	—	132	—	130,7	130,1	129,5	128,2	126,9	125,7	124,4	123,2	121,9
169,1	—	167,6	—	166,2	—	164,7	163,3	161,9	—	—	—	—
204,3	—	206,7	—	205,1	—	203,5	201,9	200,3	—	—	—	—
298	—	296,1	—	294,2	—	292,2	290,3	288,4	—	—	—	—
391,5	—	389,3	—	387	—	384,8	382,6	380,5	—	—	—	—
510,2	—	507,7	—	505,2	—	502,7	500,1	497,6	495,1	492,7	490,2	487,7
644,7	—	641,8	—	639	—	636,2	633,3	630,5	627,7	624,9	622,1	619,3
794,9	—	791,7	—	788,5	—	785,4	782,3	779,1	776	772,9	769,8	766,7
1142	—	1138	—	1134	—	1130	1126	1123	1119	1115	1112	1108

Note. The cross-sectional area of tube from bore $f_в$, $см^2$ is determined by the multiplication of corrected values for 10.

Key: (1). Outside diameter of tube $D_н$ in mm. (2). $q_в$ with the wall thickness of tube s in mm.

Pages 26-27.

2.4. Parts of pipelines.

The used in thermal grid/networks parts of the pipelines: branch/removals, transfer/transitions, union couplings at an angle and flat/plane bottoms must be steel and satisfy the requirements for the rules of Gosgortekhnadzor. The parts of pipelines according to SNIP I-G.7-62 can be manufactured on the interdepartmental standards (MVN) or on the standards of machine-building (MN) depending on the conditions of installation and supply of pipelines.

During the application/use of branch/removals and transfer/transitions on MN, manufactured with the wide nomenclature of wall thickness, one should consider that the wall thickness of branch/removal or transfer/transition must not exceed the wall thickness of connected tube more than on 3 mm, since with larger difference becomes complicated the adjustment of the end/faces of tube and parts and is impeded the production of welding joint.

Branch/removals. In thermal grid/networks are applied the bent smooth, sharply bent and welded branch/removals.

The bent smooth branch/removals are applied for the internal diameters of tubes $D_y < 400$ mm and are made by the direct flexure of direct/straight seamless pipes. Radii of the centerline of the bend of tubes in this case accept not less than following values:

for smooth flexure with preliminary packing by sand and heating - it is not less than 3.5 outside diameters of tube;

for the smooth flexure, fulfilled on single-purpose machine without packing by sand in cold states, are not less than 4 outside diameters of tube.

Table 2.13. Moment of resistance of the cross section of tube W in cm^3.

(1) Наружный диаметр трубы $D_н$ в мм	(2) W при толщине стенки трубы s в мм											
	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
18	0.296	0.363	0.417	0.458	0.492	0.518	0.536	0.55	—	—	—	—
25	0.614	0.77	0.906	1.02	1.12	1.21	1.28	1.33	1.38	1.42	1.45	1.48
32	1.05	1.33	1.59	1.82	2.02	2.2	2.36	2.5	2.62	2.73	2.82	2.89
38	1.51	1.93	2.32	2.68	3	3.29	3.56	3.8	4.01	4.21	4.38	4.53
45	2.16	2.78	3.36	3.9	4.4	4.86	5.28	5.67	6.03	6.35	6.65	6.93
57	3 54	4.59	5.59	6.53	7.42	8.25	9.04	9.78	10.5	11.1	11.7	12.3
76	6.41	8.38	10.3	12.1	13.8	15.5	17	18.6	20	21.4	22.7	24
89	8.87	11.6	14.3	16.9	19.1	21.7	24	26,2	28,4	30.4	32.4	34.3
108	13.2	17.3	21.3	25.3	29.1	32,8	36.6	39,8	43.2	46.5	49.6	52.7
133	—	—	32.8	38.9	44.9	50.8	56.5	62	67.4	72.7	77.9	82.9
159	—	—	—	—	—	—	82	90.3	98.4	106	115	122
194	—	—	—	—	—	—	—	137	149	162	174	185
219	—	—	—	—	—	—	—	—	—	208	224	239
273	—	—	—	—	—	—	—	—	—	—	354	379
325	—	—	—	—	—	—	—	—	—	—	—	—
377	—	—	—	—	—	—	—	—	—	—	—	—
426	—	—	—	—	—	554	621	688	—	820	—	950
478	—	—	—	—	—	700	785	869	—	1037	—	1202
529	—	—	—	—	—	859	964	1068	—	1275	—	1479
630	—	—	—	—	—	1223	1373	1522	—	1818	—	2110
720	—	—	—	—	—	—	—	1994	—	2383	—	2768
820	—	—	—	—	—	—	—	2593	—	3100	—	3603
920	—	—	—	—	—	—	—	3270	—	3911	—	4548
1020	—	—	—	—	—	—	—	4026	—	4817	—	5603
1220	—	—	—	—	—	—	—	—	—	—	—	8116

2 W при толщине стенки трубы s в мм											
7.5	8	8.5	9	9.5	10	11	12	13	14	15	16
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
2.98	3.02	—	—	—	—	—	—	—	—	—	—
4.66	4.78	—	—	—	—	—	—	—	—	—	—
7.18	7.4	7.61	7.79	7.95	8.09	—	-	—	—	—	—
12.8	13.3	13.8	14.2	14.6	15	15.6	16.1	16.6	—	—	—
25.2	26.4	27.4	28.5	29.5	30.4	32.1	33.7	35	36.2	37.3	38.3
36.1	37.9	39.6	41.2	42.7	44.2	47	49.5	51.8	53.9	55.9	57.6
55.7	58.5	61.3	64	66.6	69.2	73.9	78.4	82.6	86.4	90	93.3
87.9	92.6	97.3	101.9	106.2	110.6	118.9	126,8	134.2	141.2	147.9	154.2
138	135	144	151	157	164	177	190	201	213	224	234
197	209	220	231	242	253	274	294	314	333	351	368
285	270	285	299	314	328	356	383	409	435	459	483
404	429	453	477	501	524	570	615	659	702	744	784
560	616	652	687	722	756	824	891	956	1020	1082	1144
—	—	—	935	983	1031	1125	1217	1308	1397	1485	1571
—	1074	—	1204	1266	1328	1451	1571	1690	1807	1923	2036
—	1365	—	15.6	—	1685	1842	1997	—	—	—	—
—	1680	—	1879	—	2076	2271	2463	—	—	—	—
—	2400	—	2698	—	2972	3254	3532	—	—	—	—
—	3150	—	35.9	—	3905	4278	4647	—	—	—	—
—	4103	—	4599	—	5091	5579	6064	6546	7023	7497	7963
—	5181	—	5810	—	6434	7054	7670	8282	8890	9494	10094
—	6385	—	7162	—	7934	8702	9465	10223	10977	11727	12472
—	9079	—	10250	—	11410	25040	27260	29460	31620	33840	36120

Key: (1). Outside diameter of tube $D_н$ in mm. (2). W with the wall thickness of tube s in mm.

Table 2.14. Area of tube according to outside diameter and surface 1 m of tube.

(1) Наружный диаметр трубы $D_н$ в мм	(2) Площадь трубы по наружному диаметру $F_н$ в см²	(3) Поверхность 1 м трубы $F_{тр}$ в м²	(1) Наружный диаметр трубы $D_н$ в мм	(2) Площадь трубы по наружному диаметру $F_н$ в см²	(3) Поверхность 1 м трубы $F_{тр}$ в м²
18	2,55	0,566	219	376,7	0,688
25	4,91	0,785	273	585,3	0,858
32	8,04	0,101	325	829,6	1,02
38	11 34	0,119	377	1116	1,18
45	15,9	0,141	426	1425	1,34
57	25,52	0,179	478	1795	1,5
76	45,36	0,239	529	2198	1,65
89	62,21	0,28	630	3117	1,98
108	91 61	0,339	720	4072	2,26
133	138,9	0,418	820	5281	2,58
159	198,6	0,5	920	6648	2,89
194	295,6	0,61	1020	8171	3,2
			1220	11300	3,83

Key: (1). Outside diameter of tube D_H in mm. (2). area of tube according to outside diameter F_H in cm². (3). Surface 1 m of tube F_{TP} in m².

Table 2.15. Basic dimensions of light/lung water-gas conducting tubes according to GOST 3262-62.

(1) Условный проход D_y в мм	(2) Наружный диаметр $D_н$ в мм	(3) Толщина стенки в мм: (9) номинальная s	(10) расчетная $s^р$	(4) Внутренний диаметр в мм: (11) $D_в$ при s	(12) $D_в^р$ при $s^р$	(5) Площадь в см²: (13) $F_н$ по $D_н$	(14) $F_в$ по $D_в$	(6) Площадь поперечного сечения стенки трубы в см²: (15) f при s	(16) $f^р$ при $s^р$	(7) Момент сопротивления поперечного сечения трубы в см³: (17) W при s	(18) $W^р$ при $s^р$	(8) Момент инерции поперечного сечения трубы в см⁴: (19) J при s	(20) $J^р$ при $s^р$
15	21,3	2,5	2	16,3	17,3	3,563	2,087	1,476	1,212	0,622	0,545	0,655	0,571
20	26,8	2,5	2	21,8	22,8	5,641	3,733	1,908	1,558	1,06	0,889	1,43	1,21
25	33,5	2,8	2,3	27,9	28,9	8,814	6,114	2,7	2,254	1,91	1,64	3,2	2,75
32	42,3	2,8	2,3	36,7	37,7	14,05	10,58	3,47	2,89	3,21	2,74	6,77	5,8
40	48	3	2,5	42	43	18,1	13,85	4,25	3,56	4,48	3,86	10,85	9,28
50	60	3	2,5	54	55	28,27	22,9	5,37	4,51	7,27	6,23	21,85	18,7
70	75,5	3,2	2,7	69,1	70,1	44,77	37,5	7,27	6,18	12,6	10,82	47,6	40,9
80	88,5	3,5	2,97	81,5	82,56	61,51	52,17	8,34	7,07	19,1	16,55	84,5	73,3
100	114	4	3,4	106	107,2	102,1	88,25	13,85	11,84	36,7	31,8	209	181
125	140	4	3,4	132	133,2	153,9	136,8	17,1	14,6	56,6	48,7	396	341
150	(165)	4	3,4	157	158,2	213,6	193,6	20,2	17,2	79,4	68,2	661	569

Key: (1). The internal diameter D_y in mm. (2). Outside diameter D_H in mm. (3). Wall thickness in mm. (4). Bore in mm. (5). Area in cm². (6). Cross-sectional area of the

wall of tube in cm^2. (7). Moment of resistance of the cross section of tube in cm^3. (8). Moment of the inertia of the cross section of tube in cm^4. (9). nominal. (10). calculated. (11). or. (12). on.

Page 28.

During installation on the pipelines of the bent smooth branch/removals the distance from nearest transverse weld to the beginning of flexure is accepted not less than the outside diameter of tubes but not less than 100 mm.

Smooth branch/removals with the mean radius of bend not less than 3.5 outside diameters of tubes are made with wall thickness on the "assortment of the tubes of thermal grid/networks".

The expanded/scanned length of branch/removal for any angle of rotation is determined from the formula

$$l_\varphi = \frac{l_{90}\varphi}{90} \text{ мм}, \qquad (2.1)$$

where l_{90} is the expanded/scanned length of branch/removal at the angle of rotation 90° on Table 2.16 in mm;

ϕ - angle of rotation in deg.

For the pipelines of thermal grid/networks, can also be applied the bent branch/removals on MN.

The sharply bent branch/removals of prefabrication are applied for the conditional pressures of heat carrier $P_y < 64$ kg/cm^2.

Welded branch/removals are manufactured from seamless and welded pipes with the internal diameter $D_y > 150$ mm.

Tubes and the mark/brands of steel for the manufacture of welded branch/removals are selected in accordance with the "assortment of the tubes of thermal grid/networks".

Transfer/transitions. During changes in the diameters of the pipelines of thermal grid/networks, are applied symmetrical and unsymmetric transfer/transitions.

In thermal grid/networks in essence, are applied unsymmetric transfer/transitions for alignment/levelling of the

bottom of tubes to avoid the accumulation of condensate in steam lines, the possibility of applying of one-type supports, etc.

Symmetrical transfer/transitions are installed, as a rule, on the vertical sections of pipelines.

The following types of transitions are used:

eccentric and concentric steel die-forge/stamped;

unsymmetric and symmetrical welded, manufactured from sheet steel.

Connection of pipelines. The connection of pipelines at right angles during branches, the installation of drain pipes or drains is realize/accomplished depending on diameters and parameters of heat carriers with cover plates for the reinforcement of the place of union coupling or without cover plates (table 2.17).

Table 2.16. Expanded/scanned length of the bent smooth branch/removals at an angle of 90°.

(1) Условный проход трубы D_y в мм	(2) Радиус осевой линии отвода в мм	(3) Развернутая длина отвода в мм
25	150	236
32		
40	200	314
50		
70	350	550
80		
100	500	785
125		
150	600	942
175	750	1178
200	850	1335
250	1000	1570
300	1200	1884
350	1500	2355
400	1700	2670

Key: (1). The internal diameter of tube D_y in mm. (2). Radius of the centerline of branch/removal in mm. (3). Expanded/scanned length of branch/removal in mm.

Table 2.17. Connections of pipelines.

(1) Условный проход трубы D_y в мм	(2) Условный проход ответвления в мм при параметрах теплоносителя: $P_{раб}$ в кгс/см², t в °С			
	$P_{раб} = 13$, $t = 300$	$P_{раб} = 16$, $t = 150$	$P_{раб} = 21$, $t = 350$	$P_{раб} = 36$, $t = 425$
70	—	—	—	40—70
80	—	—	—	40—80
100	—	—	—	40—100
125	—	—	—	40—125
150	—	—	—	40—150
175	—	—	70—175	40—175
200	—	—	70—200	40—200
250	—	—	80—250	40—250
300	—	—	100—300	70—300
350	—	—	100—350	70—350
400	—	—	100—400	40—100
400	100—400		—	—
450	100—450		—	—
500	100—500		—	—
600	100—600		—	—
700	100—700		—	—
800	100—800		—	—
900	100—900		—	—
1000	125—1000		—	—

Notes: 1. Cover plates are applied for the internal diameters of branches, indicated by numerals.

2. Heavy line designated boundary/interface between seamless and wrought pipes.

Key: (1). The internal diameter of tube D_y in mm. (2). The internal diameter of branch in mm with the parameters of the heat carrier: $P_{раб}$ in kg/cm², t in °C.

Chapter 3.

PIPE SUPPORTS

3.1. Movable supports.

Page 29.

In thermal grid/networks, depending on the method of packing and diameters of the pipes, are applied the sliding, roller, suspension (simple and spring) movable supports.

In the sections of channel-free pipe laying the movable supports are not establish/installed.

Sliding bases for tubes by the internal diameter to D_y

175 mm inclusively are applied in all methods of the packing of thermal grid/networks. For tubes by the internal diameter D_y from 200 to 1200 mm sliding bases are applied in tubing in impassable and semiaccess channels and for lower run of pipes in tunnels, and also for the upper conduit/manifolds, laid on tubes. The flight/spans between mobile saddles calculate for strength in accordance with the indications of chapter 10.

The recommended flight/spans between movable supports for tubes on the "assortment of the tubes of thermal grid/networks" with above-grade packing and in tunnels (for upper runs of pipes) for the averaged conditions of the calculation of conduit/manifold on direct/straight sections are given in Table 3.1, for other sections to these flight/spans, is introduced the coefficient:

(1) для участков между ближайшими к повороту опорами (*до и после поворота*)	0,67
(2) для участков между последней и предпоследней опорами конечной точки трубопровода (перед заглушкой, гибким компенсатором или поворотом)	0,82
(3) для последних двух участков с каждой стороны сальникового компенсатора	0,5

Key: (1). for the sections between the nearest to rotation supports (before and after rotation). (2). for the sections between the last/latter and penultimate supports of the end

point of conduit/manifold (before the plug/silencer, flexible compensator or rotation). (3). for last/latter two sections from each side of gasket compensator.

The flight/spans between mobile saddles on concrete pillows with packing in impassable and semiaccess channels and tunnels (for lower run of pipes) are given in Table 3.2.

Table 3.1. Flight/spans between mobile saddles with above-grade packing and in tunnels (for upper runs of pipes). on direct/straight sections.

(4) Условный проход D_y в мм	(1) Компенсаторы П-образные или самокомпенсация				(2) Компенсаторы сальниковые	
	(3) пролеты в м при параметрах теплоносителя: $P_{раб}$ в кгс/см², t в °С					
	$P_{раб} = 8$, $t = 100$; $P_{раб} = 16$, $t = 150$	$P_{раб} = 8$; $t = 250$; $P_{раб} = 13$, $t = 300$	$P_{раб} = 16$, $t = 325$; $P_{раб} = 21$, $t = 350$	$P_{раб} = 36$, $t = 425$	$P_{раб} = 8$, $t = 100$; $P_{раб} = 16$, $t = 150$	$P_{раб} = 8$, $t = 250$; $P_{раб} = 13$, $t = 300$
25	—	2	2	2	—	2
32	2	2	2	2	2	2
40	2.5	2.5	2.5	2.5	2.5	2.5
50	3	3	3	2.5	3	3
70	3.5	3.5	3.5	3	3.5	3.5
80	4	4	4	3.5	4	4
100	5	5	5	4	5	5
125	6	6	6	6	6	6
150	7	8	7	7	7	8
175	8	9	7	7	8	9
200	9	11	8	8	9	11
250	11	12	10	10	11	12
300	12	14	12	12	12	14
350	14	16	14	14	14	16
400	14	15	15	15	13	15
450	14	16	—	—	13	15
500	14	16	—	—	13	15
600	15	18	—	—	13	15
700	15	19	—	—	13	15
800	16	20	—	—	13	15
900	18	22	—	—	15	18
1000	20	24	—	—	16	20

Note. Above heavy line are shown the flight/spans for seamless pipes according to GOST 8732-58 *, under heavy line - for wrought pipes according to GOST 4015-58 and according to GOST 8696-62.

Key: (1). Compensators U-shaped or auto/self-compensation. (2). Compensators are gasket. (3). flight/spans in m in the

parameters of the heat carrier: in kg/cm², t in °C. (4). The internal diameter

Table 3.2. Flight/spans between the movable supports of pipes on concrete pillows.

(1) Условный проход труб D_y в мм	(2) Пролет между подвижными опорами в м	(1) Условный проход труб D_y в мм	(2) Пролет между подвижными опорами в м
25	1.7	200	6
32	2	250	7
40	2.5	300	8
50	3	350	8
70	3	400	8.5
80	3.5	450	9
100	4	500	10
125	4.5	600	10
150	5	700	10
175	6	800	10

Note. Table is comprised for the constructions of concrete pillows on a series artificial satellite-01 04 "standardized composite reinforced-concrete channels".

Key: (1). The internal diameter of tubes — in mm. (2). Flight/span between movable supports in m.

Page 30.

With multitube pipe laying in the impassable channels

of support, they place staggered. With above-grade pipe laying and in tunnels is accepted one distance between movable supports, since they all rest on framework/bodies, traverses or beams. With large differences in flight/spans for small tubes can be establish/installed additional supports, and large tubes can rest through one or several crossheads.

Roller bearings are applied for tubes by the internal diameter D_y -200 mm and it is more with pipe laying on the separately standing low and high supports, on the walls of buildings and in tunnels on framework/bodies and brackets.

During the setting up of roller bearings, the gradient/draft of conduit/manifolds must not exceed

$$i < \frac{0,05}{r}, \qquad (3.1)$$

where 0.05 is an arm of rolling friction over the contact area of cylinder with housing and base plate in cm;

r - a radius of roller in cm.

Roller bearings with pipe laying in impassable channels do not apply.

With above-grade pipe laying on piers with span structure for the internal diameters of tubes D_y=200 mm and more are applied both the sliding and roller bearings. Roller bearings are establish/installed when the application/use of sliding bases is led to the weight increase of drive/girders.

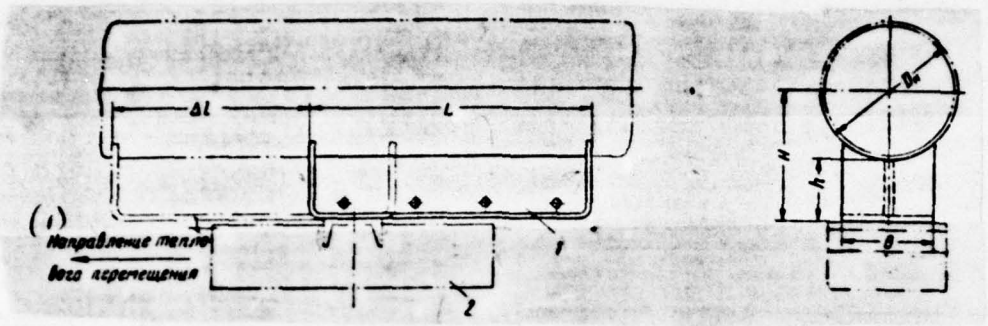


Fig. 3.1. Sliding saddle $D_н = 32 \div 194$ mm. 1 - housing; 2 - supporting structure.

Key: (1). Direction of thermal displacement/movement.

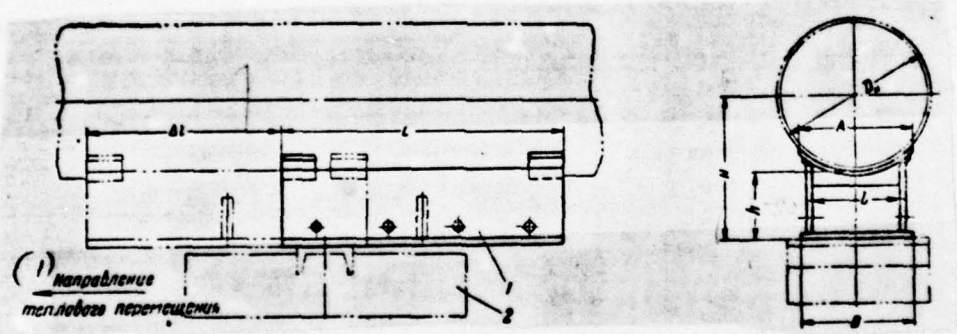


Fig. 3.2. Sliding saddle $D_н = 219 \div 1020$ mm. 1 - housing; 2 - supporting structure.

Key: (1). Direction of thermal displacement/movement.

Table 3.3. Normal sliding saddles on NVN 1301-60; NVN 1305-60 and NVN 1308-60 (Figs. 3.1 and 3.2).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Номер МВН		(3) Размеры в мм								(4) Вес в кг		(5) Наибольшее тепловое перемещение Δl в мм
	(1) при h = 90 мм	(1) при h = 140 мм	A	B (2) при h = 90 мм	B (2) при h = 140 мм	L	l (2) при h = 90 мм	l (2) при h = 140 мм	H (2) при h = 90 мм	H (2) при h = 140 мм	(2) при h = 90 мм	(2) при h = 140 мм	
32	1301-11	–	–	40	–	280	–	–	106	–	1.21	–	180
38	1301-12	–	–	40	–		–	–	110	–		–	
45	1301-13	–	–	50	–		–	–	113	–	1,57	–	
57	1301-14	–	–	50		300	–	–	118	–	1.6	–	220
76	1301-15	–	–	70	–		–	–	128	–	1.9	–	
89	1301-16	–	–	80	–		–	–	135	–	2.59	–	
108	1301-17	–	–	90	–		–	–	145	–	2,76	–	
133	1301-18	–	–	100	–		–	–	157	–	2.95	–	280
159	1301-19	1301-20	–	110	110	400	–	–	170	220	3,14	4,11	
194	1301-21	1301-22	–	130	130		–	–	188	238	3 51	4,55	
219	1305-21	1308-21	160	150	160		136	142	200	250	7,62	10,2	300
273	1305-22	1308-22	180	160	180		148	157	226	276	7,95	10,8	
325	1305-23	1308-23	230	210	230		190	204	253	303	11.6	15,2	
377	1305-24	1308-24	250	230	240	500	202	220	278	328	12,2	15,5	360
426	1305-25	1308-25	300	260	230		237	237	303	353	13,9	16,9	
478	1305-26	1308-26	320	260	260		250	250	330	380	14	17	
529	1305-27	1308-27	350	290	290	540	264	264	355	405	16	24,8	
630	1305-28	1308-28	400	350	360	570	323	336	405	455	19,3	30	
720	1305-29	1308-29	420	370	350		352	324	450	500	21,3	30,3	400
820	1305-30	1308-30	450	400	370		376	346	500	550	23,4	32,6	
920	1305-31	1308-31	500	430	430	660	412	416	550	600	31,5	40,3	
1020	1305-32	1308-32	540	470	470		446	446	600	650	40,8	47,2	

Key: (1). Outside diameter of tube ___ in mm. (2). Number of NVN. (3). Size/dimensions in mm. (4). Weight in kg. (5). Great thermal displacement/movement ___ in mm. (6). with.

Table 3.5. The roller bearings of conduit/manifolds on NVN 1309-60 and NVN 1315-60 (Fig. 3.3).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Номер МВН		(3) Размеры в мм										(4) Вес		(5) Наибольшее тепловое перемещение Δl в мм
	(6) при $h = 90$ мм	(6) при $h = 140$ мм	A	L	B_1	L_1	(6) H при $h = 90$ мм	(6) H при $h = 140$ мм	(6) B при $h = 90$ мм	(6) B при $h = 140$ мм	(6) l при $h = 90$ мм	(6) l при $h = 140$ мм	(6) при h =	при $h = 140$ мм	
219	1309-21	1315-21	160	250	200	250	255	305	150	160	136	14[illegible]	[illegible]	12.8	300
273	1309-22	1315-22	180		230		283	333	180	180	148		12.2	14.1	
325	1309-23	1315-23	230	300	270	280	310	360	210	230	1[illegible]	[illegible]	16	18.4	360
[illegible]77	1309-24	1315-24	250		280		335	385	230	240	[illegible]	220	16.8	19.1	
[illegible]	1309-25	1315-25	300		320		360	410	260	[illegible]	237	237	19.4	21.3	
478	[illegible]309-26	1315-26	320	340	340		385	435		[illegible]	250	250	21.1	23.3	
529	[illegible]	1315-27	350		380	300	413	463	[illegible]	290	264	264	25.4	31.6	400
630	1309-[illegible]	[illegible]15-28	400	360	420	320	493	543	[illegible]0	360	326	336	39.1	46.3	
720	1309-29	13[illegible]	420		440		538	[illegible]	370	350	352	324	42.1	48.1	
820	1309-30	1315-30	[illegible]50		460		58[illegible]	[illegible]38	400	370	376	346	45.5	52.1	
920	1309-31	1315-31	[illegible]	400	510	340	[illegible]	708	430	430	412	416	64.9	74.2	
1020	1309-32	1315-32	540		580		708	758	470	470	446	446	75.7	80.6	

Note. Material [illegible] plate, steel of brand st. 0, remaining parts - st. 3.

Key: (1). Outside diameter of [illegible] ___ in mm. (2). Number of NVN. (3). Size/dimensions in mm. (4). Weight in kg. (5). Greatest thermal displacement/movement ___ in mm. (6). with.

Page 32.

Table 3.4. Shortened slipping supports of conduits over MVN 1305-60 and MVN 1308-60 (see Fig. 3.27).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Номер МВН		(3) Размеры в мм								(4) Вес в кг		(5) Наибольшее тепловое перемещение Δl в мм
	(6) при $h = 90$ мм	(6) при $h = 140$ мм	A	B (6) при $h = 90$ мм	B (6) при $h = 140$ мм	L	l (6) при $h = 90$ мм	l (6) при $h = 140$ мм	H (6) при $h = 90$ мм	H (6) при $h = 140$ мм	(6) при $h = 90$ мм	(6) при $h = 140$ мм	
219	1305-41	1308-41	160	150	160	250	136	142	200	250	5,13	6,88	150
273	1305-42	1308-42	180	160	180		148	157	226	276	5,41	7,32	
325	1305-43	1308-43	230	210	230	300	190	204	253	303	7,56	9,92	180
377	1305-44	1308-44	250	230	240		202	220	278	330	7,94	10,2	
426	1305-45	1308-45	300	230	260		237	237	303	353	9,35	11,3	
478	1305-46	1308-46	320			340	250	250	330	380	10,4	12,6	200
529	1305-47	1308-47	350	290	290		264	264	355	405	11,1	17,3	
630	1305-48	1308-48	400	350	360	360	326	336	405	455	13,4	20,6	
720	1305-49	1308-49	420	370	350		352	324	450	500	15,2	21,2	
820	1305-50	1308-50	450	400	370	400	376	346	500	550	17,3	23,9	
920	1305-51	1308-51	500	430	430		412	416	550	600	23	32,3	
1020	1305-52	1308-52	540	470	470		446	446	600	650	29,5	34,5	

Note. Material - steel of brand St. 3 according to GOST 380-60.

Key: (1). Outside diameter of tube ___ in mm. (2). Number of MVN. (3). Size/dimensions in mm. (4). Weight in kg. (5). Greatest thermal displacement/movement ___ in mm. (6). with.

Table 3.5. The roller bearings of conduit/manifolds on MVN 1309-60 and MVN 1315-60 (Fig. 3.3).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Номер МВН		(3) Размеры в мм										(4) Вес в кг		(5) Наибольшее тепловое перемещение Δl в мм
	(6) при $h = 90$ мм	(6) при $h = 140$ мм	A	L	B_1	L_1	H при $h = 90$ мм	H при $h = 140$ мм	B при $h = 90$ мм	B при $h = 140$ мм	l при $h = 90$ мм	l при $h = 140$ мм	при $h = 90$ мм	при $h = 140$ мм	
219	1309-21	1315-21	160	250	200	250	255	305	150	160	136	142	11	12.8	300
273	1309-22	1315-22	180		230		283	333	180	180	148	157	12.2	14.1	
325	1309-23	1315-23	230	300	270	280	310	360	210	230	190	204	16	18.4	360
377	1309-24	1315-24	250		280		335	385	230	240	202	220	16.8	19.1	
426	1309-25	1315-25	300		320		360	410	260	260	237	237	19.4	21.3	
478	1309-26	1315-26	320	340	340		385	435			250	250	21.1	23.3	
529	1309-27	1315-27	350		380	300	413	463	290	290	264	264	25.4	31.6	400
630	1309-28	1315-28	400	360	420	320	493	543	350	360	326	336	39.1	46.3	
720	1309-29	1315-29	420		440		538	588	370	350	352	324	42.1	48.1	
820	1309-30	1315-30	450	400	460		588	638	400	370	376	346	45.5	52.1	
920	1309-31	1315-31	500		510	340	658	708	430	430	412	416	64.9	74.2	
1020	1309-32	1315-32	540		560		708	758	470	470	446	446	75.7	80.6	

Note. Material of base plate, steel of brand st. 0, remaining parts - st. 3.

Key: (1). Outside diameter of tube ___ in mm. (2). Number of MVN. (3). Size/dimensions in mm. (4). Weight in kg. (5). Great thermal displacement/movement ___ in mm. (6). with.

Simple strap supports are applied in above-grade pipe laying in piers with bracings, with the suspension of tube to tube, in some of the case in packing under highway and foot bridges, etc., in the sections of auto/self-compensation or during the setting up of U-shaped compensators. In the latter case are recommended at a distance of approximately 40 D_y the establish/installing of directing supports. During the displacement/movements of conduit/manifold in vertical plane under the effect of thermal strains, are applied spring strap supports. On the sections of conduit/manifolds with gasket compensators, the setting up of strap supports is not allow/assumed.

The characteristic of the sliding and roller bearings is given in Table 3.3-3.5.

Supports by height 90 mm are applied for conduit/manifolds with the thickness of insulation construction not more than 80 mm, and height of 140 mm for conduits with thickness of insulation construction of more than 80 mm also, in pipe laying in wet soils.

The length of normal supports corresponds to the

greatest displacement/movement of conduit/manifolds in the distances between the fixed supports, subsequent in Table 3.7. The length of the shortened supports corresponds double to the smaller extent of the thermal movement of conduit/manifold, in connection with which the possibility of applying the shortened supports is checked with the concrete/specific/actual distances between the fixed supports, accepted in project.

The characteristic of the simple suspension saddle of thermal grid/networks is given in Table 3.6, in which are included all parts, entering the support for tubes by diameter to $D_N = 500$ mm.

The length of the thrust of strap support is establish/installed structurally in each individual case, in connection with this Table 3.6 gives the weight of one meter of thrust. The standard lengths of thrusts are accepted according to the standards of machine-building MN 3957-62. The minimum length of thrusts is accepted:

for the conduit/manifolds of water thermal grid/networks and condensate pipings - not the less tenfold thermal displacement/movement of the suspension, most removed from

fixed support;

for steam lines - not the less twenty-fold thermal displacement/movement of the suspension, most removed from fixed support.

The maximum flight/spans between strap supports additionally are checked from the condition of the strength of support for the carrying capacity on support, given in Table 3.6.

For providing calculated thermal displacement of support and improvement in the conditions of its work, one should correctly establish/install support during installation. In connection with this in projects, specify the displacement of the axle/axis of the sliding and roller bearings on conduit/manifold relative to the axle/axis bearing surface (framework) and the displacement of the axle/axis of the clamp of strap supports on conduit/manifold relative to the axle/axis of fastening to framework to the side, opposite to the thermal displacement/movement of conduit/manifold, to the value: the housing of the sliding and roller bearings and clamp of strap supports - to the half of thermal elongation; the roller of roller bearings - to the fourth

of thermal elongation.

Besides the given above types of the movable supports of pipes, can be applied other types of supports, including on the standards of machine-building.

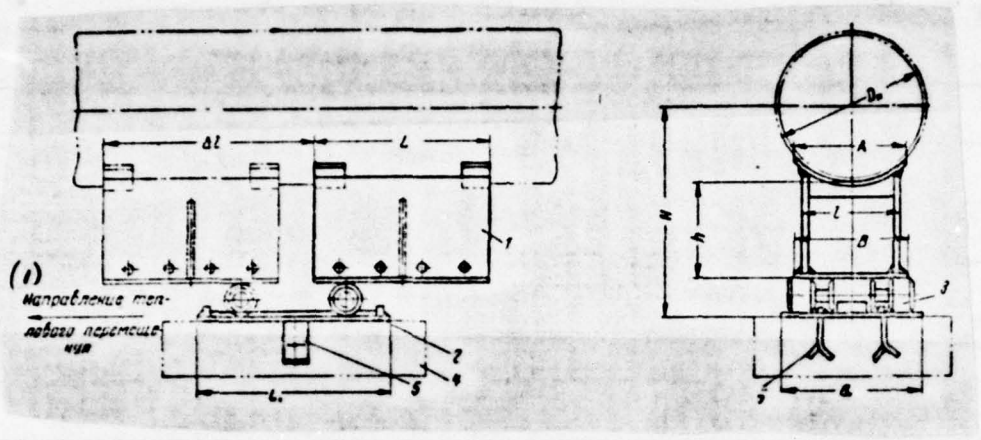


Fig. 3.3. The roller bearing of conduit/manifolds $D_н$ **-219 ÷ 1020 mm.**
1 - housing; 2 - base plate; 3 - roller; 4 - supporting structure; 5 - welded feet.

Key: (1). Direction of thermal displacement/movement.

Page 34.

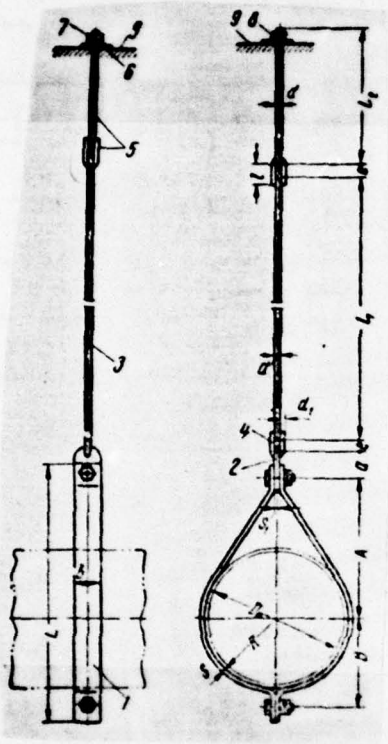


Fig. 3.4. Simple suspension saddle $D_н$=57 ÷ 529 мм. 1 - clamp; 2 - link; 3 - thrust threaded; 4 - ear; 5 - thrust with ear; 6 - washer; 7 - nut hexahedral; 8 - nut hexahedral is low; 9 - framework.

Page 35.

Table 3.6. Simple suspension saddles according to MN (Fig. 3.4).

(16) Наружный диаметр трубы $D_н$ в мм	(1) Хомут МН 3941–62								(2) Серьга МН 3965–62			
	(11) Размеры в мм						(12) Шифр	(13) Вес в кг	a в мм (14)	s_1 в мм (15)	Шифр (15)	(17) Вес в кг
	L	B	A		s	b						
1	2	3	4	5	6	7	8	9	10	11	12	13
57	285	50	200	30	5	30	57–300	0,77	80	8	120	0,26
76	305	60	210	39			76–300	0,92				
89	345	70	240	45			89–300	1,03				
108	365	85	235	55		40	108–750	1,54	100	12	140	0,42
133	405	95	260	67		50	133–900	2,04				
159	430	105	275	80		50	159–1000	1,80				
194	500	125	325	98		50	194–1000	3,03				
	495	130	305			80	194–1500	4,70	120	16	170	0,90
219	560	140	355	111	6	50	219–1000	3,25	100	12	140	0,42
	540	145	325			80	219–1500	5,13	120	16	170	0,90
273	600	170	355	139		80	273–1500	5,73				
	630	190	365		10	90	273–3200	11,55	160	20	230	2,08
325	670	200	390	165	6	80	325–1800	6,65	130		200	1,85
	695	215	400		10	90	325–3400	12,87	160		230	2,08
377	725	225	420	191	6	80	377–1800	7,31	130		200	1,85
	755	245	430		10	90	377–3400	13,97	160		230	2,08
426	790	260	455	216			426–3200	14,6	140		210	1,92
	815	270	465				426–4500	16,34	180	25	250	3,58
478	855	285	490	243	10	80	480–2400	14,4	140	20	210	1,92
	895	300			12	100	480–5500	22,88	180	25	250	3,58
529	920	320	520	268	10	80	530–4000	15,88	160	20	230	2,08
	950	325			12	100	530–5500	24,32	180	25	250	3,58

Table 3.6 (Continued)

(3) Тяга резьбовая МН 3957—62			(4) Ушко МН 3960—62					(5) Тяга с ушком МН 3969—62				(6) Шайба ГОСТ 6967—54		Гайка шестигранная ГОСТ 5915—62 (7)	Гайка шестигранная низкая ГОСТ 5916—62 (8)	Наибольшие допускаемые нагрузки на опору в т (9)
d в мм (14)	(15) Шифр	(16) Вес одного метра в кг	d_1 в мм (14)	l в мм (14)	r в мм (14)	Шифр (15)	(13) Вес в кг	d в мм (14)	e в мм (14)	(15) Шифр	Вес наплавленного металла сварных швов в кг (17)	Наружный диаметр в мм (18)	Вес одной шайбы (19)	(20) Вес одной гайки в кг	(20) Вес одной гайки в кг	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
M10	M10×L_1	0,62	10	35	6,5	10	0,06	M10	8,5	M10×L_2	0,02	22	0,00308	0,012	0,009	0,2 0,3 0,3
M16	M16×L_1	1,58	16	55	10	16	0,26	M16	12	M16×L_2	0,06	32	0,01391	0,034	0,021	0,75 0,9 1 1 1,5 1 1,5 1,5
M24	M24×L_1	3,55	24	80	14	24	0,85	M24	18	M24×L_2	0,18	45	0,0345	0,11	0,058	3,2
M20	M20×L_1	2,47	20	65	12	20	0,49	M20	14	M20×L_2	0,11	38	0,02174	0,065	0,036	1,8
M24	M24×L_1	3,55	24	80	14	24	0,85	M24	18	M24×L_2	0,18	45	0,03453	0,11	0,058	3,4
M20	M20×L_1	2,47	20	65	12	20	0,49	M20	14	M20×L_2	0,11	38	0,02474	0,065	0,036	1,8
M24	M24×L_1	3,55	24	80	14	24	0,85	M24	18	M24×L_2	0,18	45	0,03453	0,11	0,058	3,4 3,2
M27	M27×L_1	4,5	27	90	16	27	1,22	M27	19	M27×L_2	0,24	52	0,0529	0,166	0,091	4,5
M20	M20×L_1	2,47	20	65	12	20	0,49	M20	14	M20×L_2	0,11	38	0,02174	0,065	0,036	2,4
M30	M30×L_1	5,55	30	100	17,5	30	1,68	M30	22,5	M30×L_2	0,35	55	0,06363	0,231	0,116	5,5
M27	M27×L_1	4,5	27	90	16	27	1,22	M27	19	M27×L_2	0,24	52	0,03453	0,166	0,058	4
M30	M30×L_1	5,55	30	100	17,5	30	1,68	M30	22,5	M30×L_2	0,35	55	0,06363	0,231	0,116	5,5

Notes: 1. For thrust with ear according to MN 3959-62 weight of one meter of thrust, are accepted according to graph/count 16, and the weight of ear according to graph/count 21.

2. Clamps of suspensions, are applied in execution 1, which corresponds to temperature of heat carrier to 450°C.

3. Material of parts of suspension saddles: clamp of suspension - half ring St. 3 according to GOST 380-60, bolts St. 5 according to GOST 380-60 and steel 40 according to GOST 1050-60, nut St. 3 according to GOST 380-60 and steel 35 according to GOST 1 (50-60; link of suspension St. 5 according to GOST 380-60; rod threaded St. 4 according to GOST 380-60; ear St. 4 according to GOST 380-60; washer steel 10 according to GOST 1050-60; nut steel 10 according to GOST 1050-60.

Key: (1). Clamp MN 3941-62. (2). Link MN 3965-62. (3). Rod threaded MN 3957-62. (4). Bar MN 3960-62. (5). Rod with ear MN 3959-62/ (6). Washer GOST 6957-54. (7). Nut hexahedral GOST 5915-62. (8). Nut hexahedral low GOST 5916-62. (9). Carrying capacity on support N. (10). External diameter of tube —— in mm. (11). Size/dimensions in mm.

(12). Code. (13). Weight in kg. (14). in mm. (15). Code. (16). Weight of one meter in kg. (17). Weight of the deposited weld metal in kg. (18). Outside diameter in mm. (19). Weight of one washer in kg. (20). Weight of one nut in kg.

Page 36.

3.2. Fixed supports.

Fixed supports record/fix the isolated points of conduit/manifold, they divide it into independent in the relation to temperature elongations sections and absorb the effort/forces, which appear in conduit/manifolds in different diagrams and with methods of the compensation for thermal elongations.

Fixed supports are provided for on conduit/manifolds with all methods of the packing of thermal grid/networks.

The sites of installation of fixed supports combine, as

a rule, with the assemblies of branch pipes, sites of installation on the conduit/manifolds of close fitting valve, gasket compensators, sludge pans and another equipment.

The distances between fixed supports calculate of tubes for strength and by compensation capacity of gasket compensators.

The distance between fixed supports according to the compensation capacity of gasket compensators is determined from the formula

$$L = \frac{a_{расч}}{\alpha (t - t_{н.о})} \kappa, \qquad (3.2)$$

where $a_{расч}$ — the calculated compensation capacity of gasket compensator in мм;

t is the calculated temperature of heat carrier in °C;

$t_{н.о}$ — the calculated temperature of surrounding air for the planning of heating in °C;

α - the coefficient of the linear expansion of tube steel in мм/м °C.

The recommended distances between fixed saddles are given in Table 3.7.

Table 3.7. Distances between fixed saddles.

(4) Условный проход труб D_y в мм	(1) Компенсаторы П-образные						(2) Компенсаторы сальниковые		
	(3) Расстояния между неподвижными опорами в м при параметрах теплоносителя: $P_{раб}$ в кгс/см², t в °С								
	$P_{раб}$ = 8, t = 100; $P_{раб}$ = 16, t = 150	$P_{раб}$ = 8, t = 250	$P_{раб}$ = 13, t = 300	$P_{раб}$ = 13, t = 325; $P_{раб}$ = 21, t = 350	$P_{раб}$ = 36, t = 425	$P_{раб}$ = 8, t = 100; $P_{раб}$ = 16, t = 150	$P_{раб}$ = 8, t = 250	$P_{раб}$ = 13, t = 300	
25	—	50	50	50	50	—	—	—	
32	50	50	50	50	50	—	—	—	
40	60	60	60	60	60	—	—	—	
50	60	60	60	60	60	—	—	—	
70	70	70	70	70	70	—	—	—	
80	80	80	80	80	80	—	—	—	
100	80	80	80	80	80	70	60	50	
125	90	90	90	80	80	70	60	50	
150	100	100	90	80	80	80	70	60	
175	100	100	100	90	80	80	70	60	
200	120	120	100	100	80	80	70	60	
250	120	120	100	100	80	100	70	60	
300	120	120	120	120	100	100	70	60	
350	140	120	120	120	100	120	70	60	
400	160	140	140	120	100	140	100	80	
450	160	140	140	—	—	140	100	80	
500	180	160	150	—	—	140	100	80	
600	200	160	150	—	—	160	100	80	
700	200	160	160	—	—	160	100	80	
800	200	160	160	—	—	160	100	80	
900	200	160	160	—	—	160	100	80	
1000	200	160	160	—	—	160	100	80	

Note. The distances among fixed saddles on the sections of auto/self-compensation should be accepted not more than 60o/o of those who were indicated in table for U-shaped compensators.

Key: (1). Compensators are U-shaped. (2). Compensators are gasket. (3). Distances between fixed supports in m in the parameters of the heat carrier: ___ in kg/cm², t in °C. (4). The internal diameter of tubes ___ in mm.

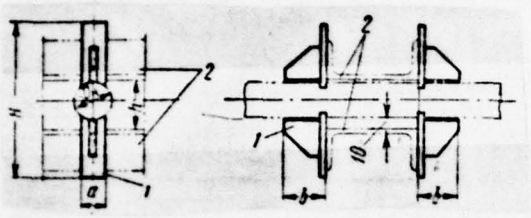


Fig. 3.5.

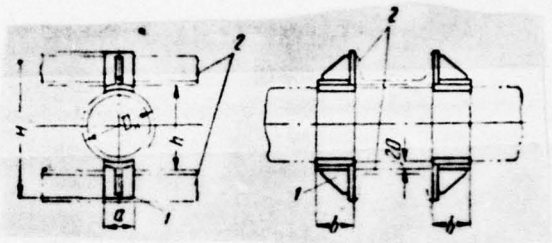


Fig. 3.6.

Fig. 3.5. Fixed saddles with vertical bilateral detents. Type I for conduit/manifolds $D_н = 32 \div 76$ mm. 1 - detent; 2 - framework.

Fig. 3.6. Fixed saddles with vertical bilateral detents. Type II for conduit/manifolds $D_н = 89 \div 219$ mm. 1 - detent; 2 - framework.

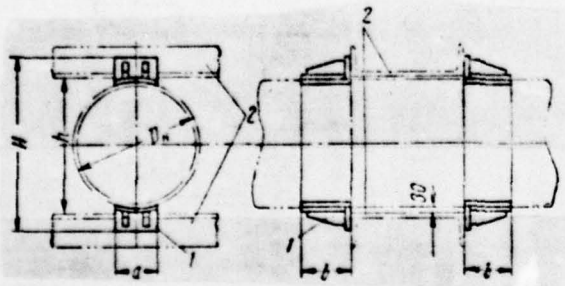


Fig. 3.7. Fixed saddles with vertical bilateral detents. Type III for conduit/manifolds $D_н = 273 \div 1020$ mm. 1 - detent; 2 - framework.

Page 37.

Table 3.8. Fixed saddles on NVN 1316-56 and NVN 1322-56 (Figs. 3.5-3.7).

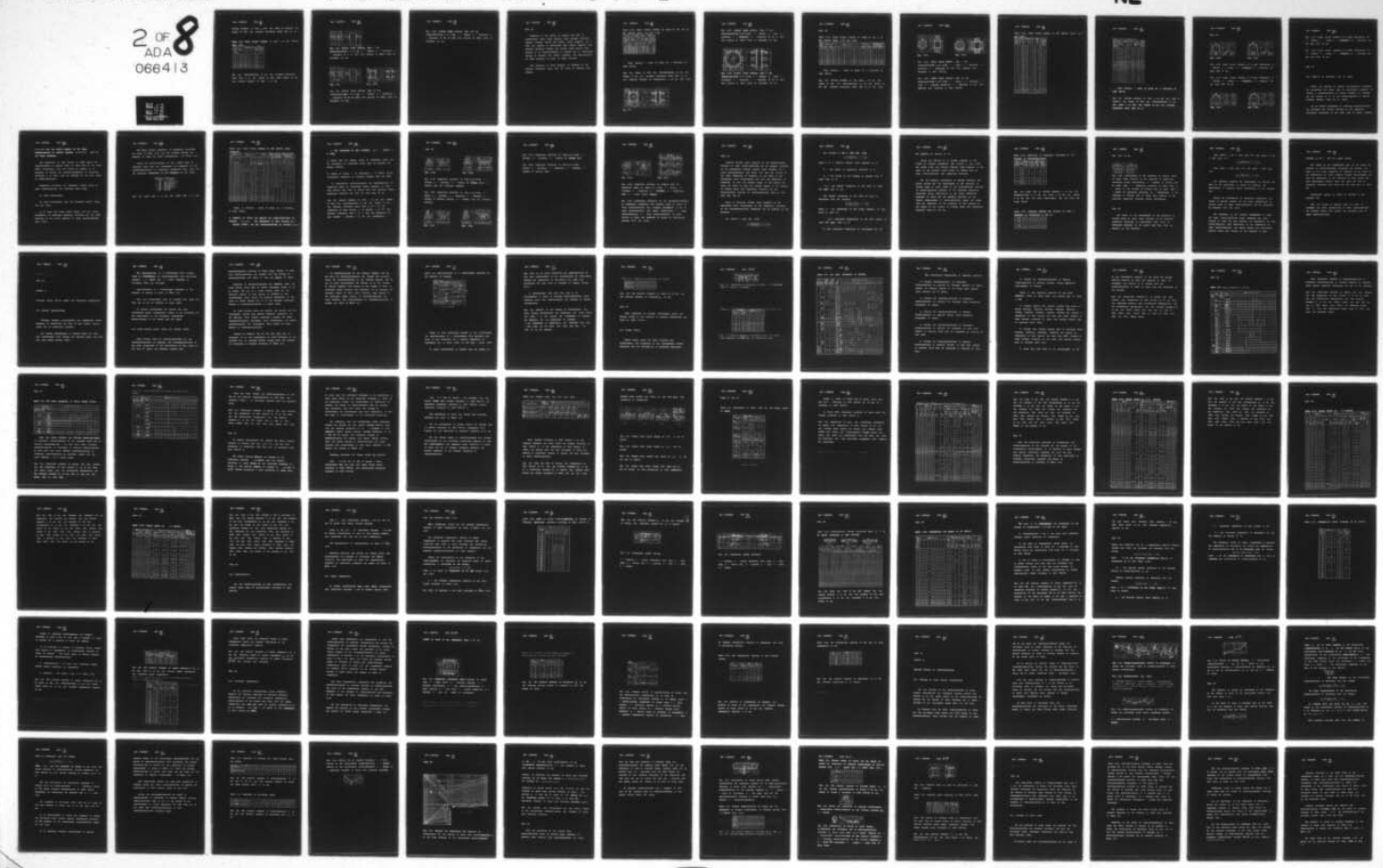
Наружный диаметр трубы $D_н$ в мм (3)	Тип опоры (4)	Номер МВН (5)	(1) Размеры в мм H	h	a	b	(2) Вес в кг	Наибольшая горизонтальная осевая нагрузка в т (6)
32	I	1316-01	170	45	20	51	0,82	1
38		1316-02	180	50	25	51	0,89	
57	I	1316-03	210	70	30	51	0,98	1
76		1316-04	230	90	40	51	1,12	
89	II	1316-05	250	115	40	60	1,56	
108		1316-06	270	130	50	60	2,13	
133		1316-07	296	155	50	60	2,13	1,5
159		1316-08	320	185	60	80	2,86	2,5
219		1316-09	380	245	80	80	4,5	4,5
273	III	1322-01	436	305	80	100	4,92	7
325		1322-02	520	360	120	130	11,4	10
377		1322-03	560	410	120	130	11,3	15
426		1322-04	616	460	150	160	22	22
478		1322-05	668	510	150	160	17,7	28
529		1322-06	710	565	200	200	27,2	35
630		1322-07	820	665	200	220	27,3	50
720		1322-08	910	755	200	250	34,6	70
820		1322-09	1028	855	250	270	48,4	90
920		1322-10	1130	955	300	300	61,6	110
1020		1322-11	1220	1055	350	350	78,4	130

Note. Material - steel of brand St. 3 according to GOST 380-60.

Key: (1). Size/dimensions in mm. (2). Weight in kg. (3).

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA
UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

2 OF 8
ADA 066413



Outside diameter of tube ____ mm. (4). Type of support. (5). Number of MVN. (6). Greatest horizontal axial load in m.

Table 3.9. Fixed frontal saddles of type I on MVN 1316-60 (Fig. 3.8).

(4) Наружный диаметр трубы $D_н$ в мм	(3) Номер МВН	(1) Размеры в мм			(3а) Вес в кг	(2) Наибольшая горизонтальная осевая нагрузка в т
		H	B	l		
32	1316-21	154	40	86	1,12	1
38	1316-22	160			1,12	
45	1316-23	166	50		1,24	1,5
57	1316-24	200	60	98	2,26	
76	1316-25	216	70		2,4	2
89	1316-26	230	70		2,42	
108	1316-27	230	80	110	3,42	3

Key: (1). Size/dimensions in mm. (2). Greatest horizontal axial load in m. (3). Number of MVN. (3a). Weight in kg. (4). Outside diameter of tube ___ in mm.

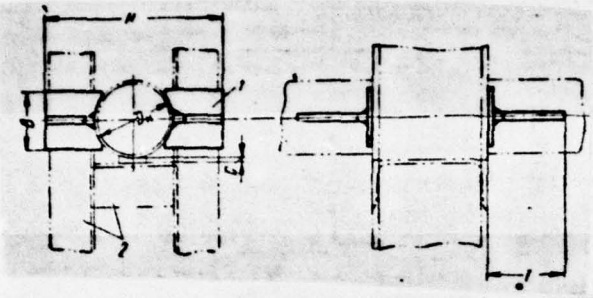


Fig. 3.8. Frontal fixed saddles. Type I for conduit/manifolds $D_y = 32 \div 108$ mm. 1 - detent; 2 - framework; c - clearance 30 m to fill with packing of sheet steel by thickness 2-4 mm.

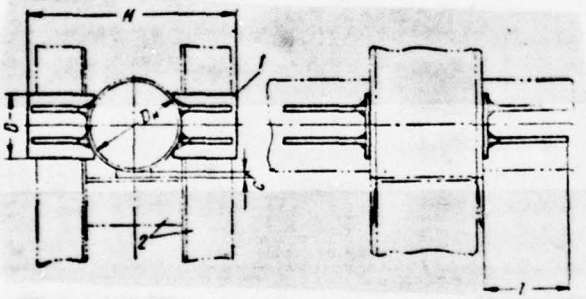


Fig. 3.9.

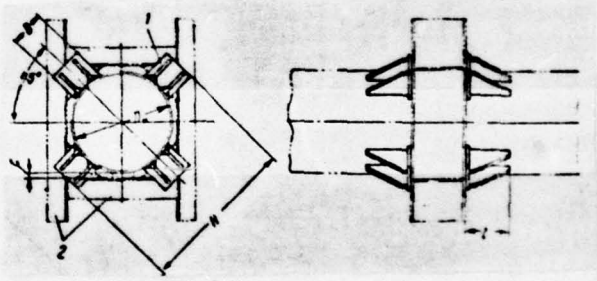


Fig. 3.10.

Fig. 3.9. Frontal fixed saddles. Type II for conduit/manifolds $D = 133 \div 377$ mm. 1 - detent; 2 - framework; c - clearance 30 mm to fill with packing of sheet steel by thickness 2-4 mm.

Fig. 3.10. Frontal fixed saddles. Type III for conduit/manifolds $D_н = 194 \div 377$ мм. 1 - detent; 2 - framework; c - clearance 30 мм to fill with packing of sheet steel by thickness 2-4 мм.

Page 38.

Depending on the method of packing and site of installation, apply fixed supports with vertical bilateral detents, frontal, shield and collar. Collar supports, as a rule, are applied in above-grade pipe laying. Supports with vertical bilateral detents and frontal apply during their setting up on framework/bodies in tunnels and in underground packing in channels and without channels. The characteristic of fixed supports is given in Table 3.8-3.15.

The selection of fixed supports is produced on the greatest horizontal axial load for which is designed this support.

Table 3.10. Fixed frontal saddles of types II and III on NVN 1316-60 (Figs. 3.9 and 3.10).

(5) Наружный диаметр трубы D в мм	(1) Номер МВН (6) тип II	(6) тип III	(2) Размеры в мм H	B	l	(3) Вес в кг (6) тип II	(6) тип III	(4) Наибольшая горизонтальная осевая нагрузка в т (6) тип II	(6) тип III
133	1316-28	—	296	90	120	6.16	—	4	—
159	1316-29	—	340	100	130	7.6	—	5	—
194	1316-30	1316-35	376			7.56	15.1		12
219	1316-31	1316-36	400			7.52	15		15
273	1316-32	1316-37	476	120	162	12.1	24.2	6	20
325	1316-33	1316-38	530			12.1	24.2		25
377	1316-34	1316-39	580			12	24	8	32

Note. Material - steel of brand St. 3 according to GOST 380-60.

Key: (1). Number of NVN. (2). Size/dimensions in mm. (3). Weight in kg. (4). Greatest horizontal axial load in m. (5). External diameter of transactions ___ in mm. (6). type.

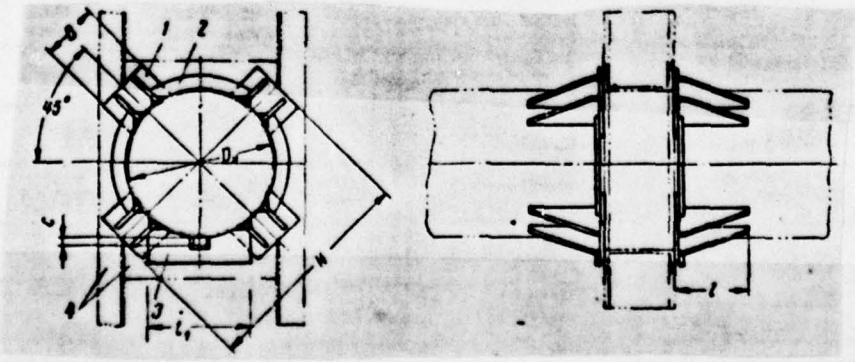


Fig 3.11.

Fig. 3.11. Frontal fixed saddles. Type IV for conduit/manifolds D_n = 426 ÷ 1020 mm. 1 - detent; 2 - arc; 3 - plate/bar; 4 - framework; c - clearance 30 mm to fill with packing of sheet steel by thickness 2-4 mm.

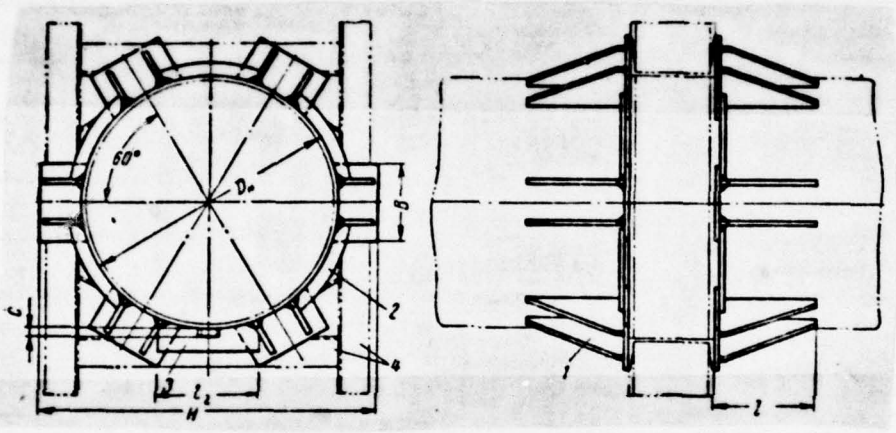


Fig. 3.12. Frontal fixed saddles. Type V for conduit/manifolds D_n = 426 ÷ 1020 mm. 1 - detent; 2 - arc; 3 - plate/bar; 4 - framework; c - clearance 30 mm to fill with packing of sheet steel by thickness 2-4 mm.

Page 39.

Table 3.11. Fixed frontal saddles of types IV and V on MVN 1316-60 (Figs. 3.11 and 3.12).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Номер МВН		(3) Размеры в мм					(4) Вес в кг		Наибольшая горизонтальная осевая нагрузка в т (5)	
	(6) тип IV	(7) тип V	H	B	l	l_1	l_2	(6) тип IV	(7) тип V	(6) тип IV	(7) тип V
426	1316-40	1316-48	630	160	222	292	176	47,4	60	25	60
478	1316-41	1316-49	680			330	202	49,4	61,4		
529	1316-42	1316-50	730	180	252	350	210	55,1	69,7		
630	1316-43	1316-51	870	200	287	414	252	71,5	90,4	40	100
720	1316-44	1316-52	960	220		470	286	78 1	97,3		
820	1316-45	1316-53	1060	240	316	528	320	106	136	50	125
920	1316-46	1316-54	1160	270		582	352	114	144	60	150
1020	1316-47	1316-55	1260	300		628	374	121.2	152	80	200

Note. Material - steel of brand St. 3 according to GOST 380-60.

Key: (1). Outside diameter of the tube ____ in mm. (2). Number of MVN. (3). Size/dimensions in mm. (4). Weight in kg. (5). Greatest horizontal axial load in m. (6). type.

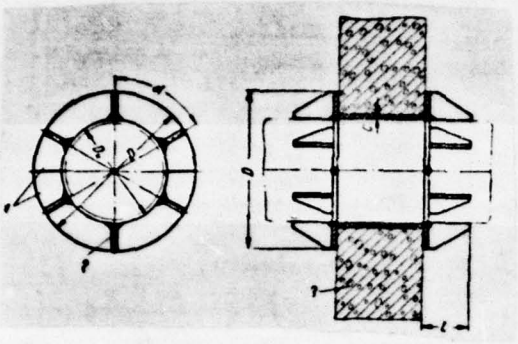


Fig. 3.13.

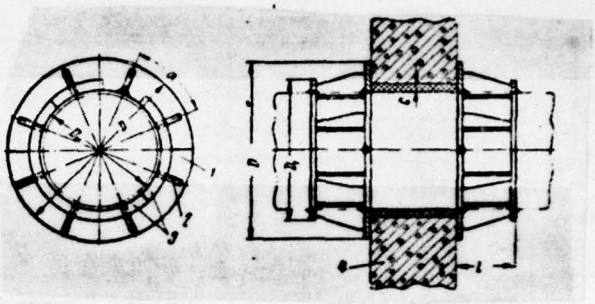


Fig. 3.14.

Fig. 3.13. Shield fixed saddles. Type I for conduit/manifolds $D_н$ = 108 ÷ 1020 mm. 1 - panel; 2 - fin/edge; 3 - framework; c - clearance to fill with asbestos cord according to GOST 1779-55.

Fig. 3.14. Shield fixed saddles. Type II for conduit/manifolds $D_н$ = 426 ÷ 1020 mm. 1 - panel; 2 - fin/edge; 3 - ring; 4 - carrying structure; c - clearance to fill with asbestos cord according to GOST 1779-55.

Table 3.12. Fixed shield saddles on MVN 1329-60 (Figs. 3.13 and 3.14).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Тип опоры	(3) Номер МВН	(4) Размеры в мм D	D_1	c	l	(5) Угол α в град	(6) Вес в кг	(7) Наибольшая горизонтальная осевая нагрузка в т
108	I	1329-21	190	—	20	90	90	4.35	5
		1329-22	230			110		7.43	12
133		1329-23	220			90		5.13	8
		1329-24	260			110		8.51	15
159		1329-25	250			90		6.04	10
		1329-26	290			110		9.75	20
194		1329-27	300		30	112	60	11.4	12
		1329-28	350			132		18.7	25
219		1329-29	350			112		15.6	20
		1329-30	400			132		23.7	35
273		1329-31	410			132		19.2	25
		1329-32	470			132		29.5	50
325		1329-33	460			132		21	30
		1329-34	520			162		35.6	65
377		1329-35	530			132		26.5	40
		1329-36	600			162		43.3	75
426	I	1329-37	570	—	40	132	45	28.9	30
	II	1329-38	620	506		178		60.4	60
		1329-39	660			203		73.9	85
478	I	1329-40	630	—		132		33.2	35
	II	1329-41	680	558		178		67.2	70
		1329-42	730			203		80.5	100
529	I	1329-43	690	—		162	36	41.5	45

Table 3.12. (Continued).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Тип опоры	(3) Номер МВН	(4) Размеры в мм D	D_1	c	l	(5) Угол α в град.	(6) Вес в кг	(7) Наибольшая горизонтальная осевая нагрузка в т
529	II	1329-44	750	610	40	208	36	85.6	85
		1329-45	800			238		107	125
630	I	1329-46	790	—		162		46.3	50
	II	1329-47	850	710		208		95.4	95
		1329-48	910			238		121	150
720	I	1329-49	880	—		162	30	53	60
	II	1329-50	940	800		208		109	110
		1329-51	1020			238		147	185
820	I	1329-52	980	—		196		82.7	70
820	II	1329-53	1030	900		242		169	140
		1329-54	1150			272		232	235
920	I	1329-55	1080	—		196		95	80
	II	1329-56	1170	1000		242		187	150
		1329-57	1260			272		279	270
1020	I	1329-58	1190	—		196		102	90
	II	1329-59	1280	1100		242		207	180
		1329-60	1380			332		314	330

Note. Material - steel of brand St. 3 according to GOST 380-60.

Key: (1). Outside diameter of tube ____ in mm. (2). Type of support. (3). Number of MVN. (4). Size/dimensions in mm. (5). Angle α in deg. (6). Weight in kg. (7). Greatest horizontal axial load in m.

Page 40.

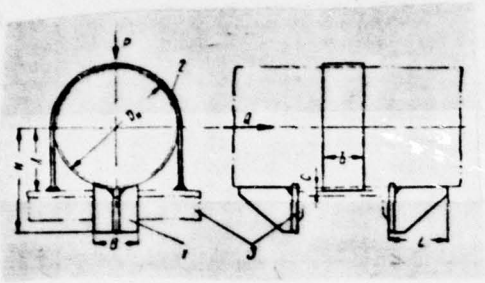


Fig. 3.15.

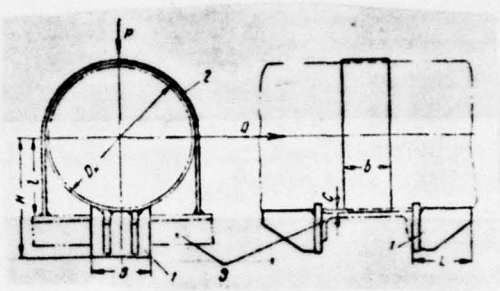


Fig. 3.16.

Fig. 3.15. Fixed collar saddles $D_н = 76 \div 108$ mm. Performance I. 1 - detent; 2 - clamp; 3 - framework; c - clearance not more than 30 mm.

Fig. 3.16. Fixed collar saddles $D_н = 133 \div 1020$ mm. Performance I. 1 - detent; 2 - clamp; 3 - framework; c - clearance are not more than 30 mm.

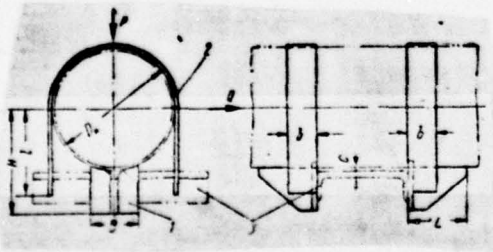


Fig. 3.17.

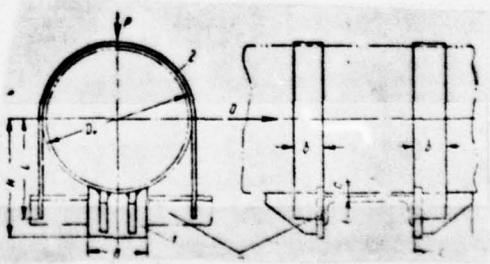


Fig. 3.18.

Fig. 3.17. Fixed collar saddles $D_н = 76 \div 108$ mm. Performance II. 1 - detent; 2 - clamp; 3 - framework; c - clearance are not more than 30 mm.

Fig. 3.18. Fixed collar saddles $D_н = 133 \div 1020$ mm. Performance II. 1 - detent; 2 - clamp; 3 - framework; c - clearance are not more than 30 mm.

Page 41.

3.3. Supports of pipelines, laid in pipes.

During the planning of thermal grid/networks, frequently are encountered the cases, when is economically expedient to utilize a conduit/manifold of greater diameter as framework for the packing on it of the conduit/manifold of smaller diameter (packing "tube not to tube").

By the Moscow department of institute Electroheat-plan are developed the working drawings of the supporting structures, adjustable on the lower tube of larger diameter

($D_н$ =273÷1020 мм) for the mobile support of the upper conduit/manifold of smaller diameter ($D_н$=57÷325 мм) and for its fixed fastening.

The temperature of heat carrier in tubes during the application/use of packing "tube on tube" must be not above 300°C; furthermore, with this method of packing it is necessary to provide for isolation/insulation of supporting structures a to lower tube for decrease in the heat losses by conduit/manifolds.

Supporting structures for displacing sliding bases of upper conduit/manifold are developed three types:

a) axial displacement;

b) axial displacement with the directing detents (Figs. 3.19 and 3.20);

c) of axial and cross travel (Figs. 3.21 and 3.22). Furthermore, is developed supporting structure for the fixed fastening of the collar supports of upper conduit/manifold (Fig. 3.23).

The basic overall dimensions of supporting structures are given in Table 3.14, and the distance between the surfaces of tubes for these constructions - in Table 3.15.

During the application/use of pipe laying "tube on religious rite" they are recommended two schematics of the arrangement/position of compensator assemblies (Fig. 3.24) and the following combination of the diameters of the tubes:

(1) Нижняя труба D_y в мм	(2) Верхняя труба D_{y1} в мм
250	50, 70, 80, 100, 125
300	50, 70, 80, 100, 125, 150
350	80, 100, 125, 150, 175
400	100, 125, 150, 175, 200
450	100, 125, 150, 175, 200
500	150, 175, 200, 250
600	150, 175, 200, 250
700	150, 175, 200, 250, 300
800	200, 250, 300
900	200, 250, 300
1000	200, 250, 300

Key: (1). Lower tube — in mm. (2). Upper tube — in mm.

Table 3.13. Fixed collar saddles on MVN 2347-63 (Figs. 3.15-3.18).

(1) Наружный диаметр трубы $D_н$ в мм	(2) Номер МВН		(3) Размеры в мм							(4) Вес в кг		(5) Наибольшая горизонтальная осевая нагрузка Q в т при параметрах теплоносителя $P_{раб}$ в кгс/см², t в °С			(6) Наибольшая поперечная нагрузка P в т при параметрах теплоносителя $P_{раб}$ кгс/см², t в °С		
	исполнение I	исполнение II	H	B	L	l		b									
						исполнение I	исполнение II	исполнение I	исполнение II	исполнение I	исполнение II	$P_{раб}=8$; $t=100$; $P_{раб}=16$; $t=150$	$P_{раб}=21$; $t=350$	$P_{раб}=36$; $t=425$	$P_{раб}=8$; $t=100$; $P_{раб}=16$; $t=150$	$P_{раб}=21$; $t=350$	$P_{раб}=36$; $t=425$
76	2347-01	2347-21	108	70	98	70	110	30	25	1,52	1,61	2,0	1,2	1,2	2	1,2	1,2
89	2347-02	2347-22	115			75	115			1,56	1,65	3	1,5	1,5	3	1,5	1,5
108	2347-03	2347-23	125	80	110	85	125			2,12	2,21	3,5	2		3,5	2	
133	2347-04	2347-24	148	90	120	98	138			3,57	3,66	4	3		4	3	2,5
159	2347-05	2347-25	170	100	130	110	150			4,36	4,45	6	5	2,5		4	
194	2347-06	2347-26	188			128	170			4,45	4,55	8	6	3			3
219	2347-07	2347-27	200			140	190	60	30	5,26	5,5	10	7	4	8	5	4
273	2347-08	2347-28	238	120	162	170	220			7,89	8,12	15	10	6			
325	2347-09	2347-29	265			195	255	80	60	9,5	10,9	22,	15	10	12	9	7
377	2347-10	2347-30	290			220	280			10	11,5	25	20				
426	2347-11	2347-31	315	160	222	245	305			12,6	14,3	18	25	15			
478	2347-12	2347-32	340			272	330			13,1	14,8	25	—	—		—	—
529	2347-13	2347-33	365	180	252	298	360			14,9	16,8						
630	2347-14	2347-34	435	200	287	348	430	100	80	23	26,4	40			20		
720	2347-15	2347-35	480	220		395	475			25,2	28,8						
820	2347-17	2347-36	530	240	316	445	525			32,8	33,8	50			22		
920	2347-16	2347-37	580	270		495	575			35,4	39,7	60					
1020	2347-18	2347-38	630	300		545	625			37,1	40,7	80					

Notes: 1. Material - steel of brand St. 3 according to GOST 380-60.

2. Supports of collar are applied for conduit/manifolds by diameter $D_н = 76 \div 1020$ мм for parameters of heat carriers $P_{раб} < 16$ kg/cm², $\leq 150°C$, and for conduit/manifolds by diameter $D_н = 76 \div 426$

мм for parameters of heat carriers $P_{раб} < 36$ kg/cm², t ≤ 425°C.

3. Clamps must not undergo action of transverse loads. For the perception of transverse loads, must be provided for special detents.

4. Length of clamps l of performance I to refine during installation depending on clearance between tube and beam.

5. Construction (airfoil/profile) and size/dimensions of supporting beams are determined during planning, in this case detents must abut by entire area with clearance among supporting structure and tube not more than 30 mm.

Key: (1). Outside diameter of tube ___ in mm. (2). Number of NVN. (3). Size/dimensions in mm. (4). Weight in kg. (5). Greatest horizontal axial load Q in t in the parameters of heat carrier ___ in kg/cm², t in °C. (6). Greatest transverse load P in t with the parameters of heat carrier ___ kg/cm², t in °C. (7). performance.

Page 42.

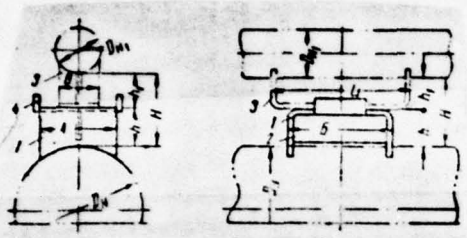


Fig. 3.19.

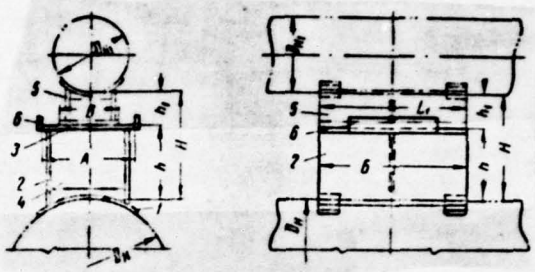


Fig. 3.20.

Fig. 3.19. Supporting structure on tube $D_y = 250 \div 350$ mm. 1 - bracket; 2 - fin/edge; 3 - housing of sliding base; 4 - detents only for directing supports.

Fig. 3.20. Supporting structure on tube $D_y = 400 \div 1000$ mm. 1 - penny; 2 - fin/edge; 3 - base/root; 4 - fin/edge; 5 - housing of sliding support; 6 - detents cnly for directing supports.

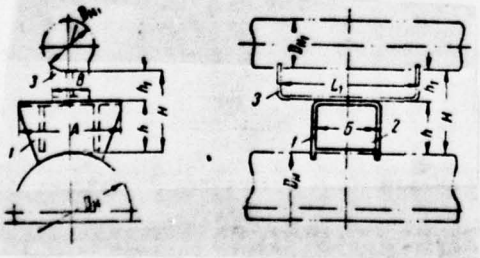


Fig. 3.21.

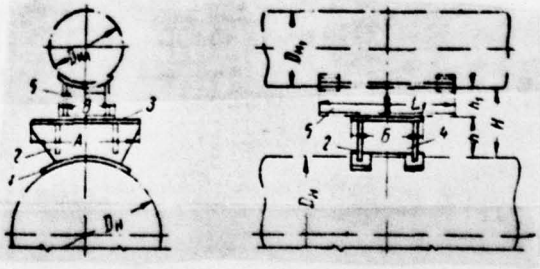


Fig. 3.22.

Fig. 3.21. Supporting structure on tube $D_y = 250 \div 350$ mm. 1 - bracket; 2 - fin/edge; 3 - housing of sliding base.

Fig. 3.22. Supporting structure on tube $D_y = 400 \div 1000$ mm. 1 - pillow; 2 - fin/edge; 3 - base/root; 4 - fin/edge; 5 - housing of sliding base.

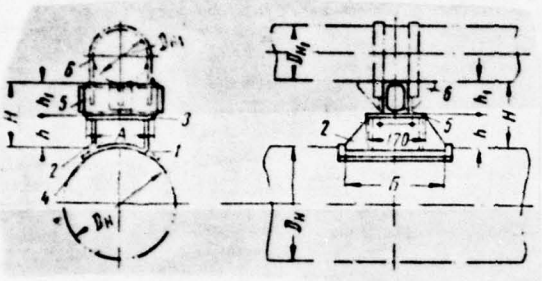


Fig. 3.23.

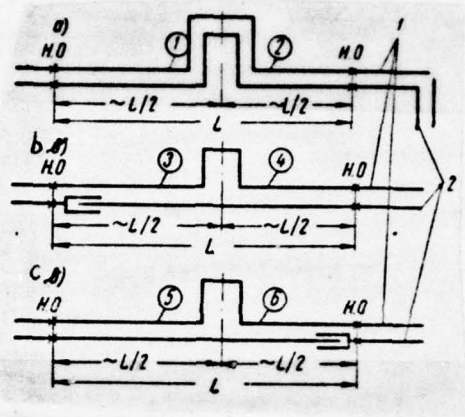


Fig. 3.24.

Fig. 3.23. Supporting structure in complex with the supporting beams on tubes $D_y = 250 \div 1000$ mm. 1 - pillow; 2 - fin/edge; 3 - base/root; 4 - fin/edge; 5 - supporting beam; 6 - fixed collar support.

Fig. 3.24. Recommended schematics of the arrangement/position of compensator assemblies with packing "tube on tube". a) lower conduit/manifold with U-shaped compensator; b and c) lower conduit/manifold with gasket compensators; 1 - upper conduit/manifold; 2 - lower conduit/manifold. In small circles is given the numbering of points to calculation formulas (3.7) and (3.8).

Page 43.

Distance between fixed supports on the direct/straight sections of upper conduit/manifolds can be accepted according to the permissible distance between fixed supports for a lower conduit/manifold (see Table 3.7) with its testing on the taken dimensions of supports, on the basis of the permissible axial displacements and with the observance of condition, so that the minimum length of the contact of those who slide so that the minimum length of the contact of sliding bases with supporting structure for the direct/straight sections of conduit/manifolds would be not less than 100 mm.

Check of distances between fixed supports on the permissible axial displacement of the supporting structures of the assigned/prescribed dimensions can be produced by the formulas:

for circuit a (see Fig. 3.24)

$$L = \frac{L_1 + Б - 200}{0{,}5(\delta_н + \delta_в)} м, \qquad (3.3)$$

for circuits b and c (see Fig. 3.24)

$$L = \frac{L_1 + B - 200}{\delta_н} м, \qquad (3.4)$$

where L is a distance between fixed supports in m;

B - the length of supporting structure in m;

L_1 - the length of the housing of sliding base of upper tube in m;

$\delta_н, \delta_в$ - the thermal elongation of one meter of lower and upper tube in mm.

The thermal elongation of one meter of pipe is determined from the formulas:

$$\delta_н = \alpha (t_н - t_{н.о}) мм/м; \qquad (3.5)$$
$$\delta_в = \alpha (t_в - t_{н.о}) мм/м, \qquad (3.6)$$

where α - the coefficient of the linear expansion of tube steel in mm/m °C;

$t_н, t_в$ - calculated temperatures of the heat carrier of lower and upper tube in °C;

$t_{н.о}$ - the calculated temperature of surrounding air for

the planning of heating in °C.

During the setting up of movable supports on the flight of U-shaped compensator (for circuit a, Fig. 3.24) one should check the distance between fixed supports on the basis of the possible cross travel of sliding base of upper conduit/manifold over supporting structure.

For the complete utilization of bearing surfaces, one should provide for the displacement of the axle/axis of sliding bases of upper tubes on the direct/straight sections of conduit/manifolds relative to the axle/axis supporting structures during installation to the value, determined depending on value and the possible direction of the thermal displacements of conduit/manifolds (upper and lower) with the observance of the condition so that minimum to the length of the contact of sliding bases with supporting structure would be 100 mm.

Table 3.14. Dimensions of supporting structures on the drawings of "Electroheat-plan".

(1) Нижняя труба наружным диаметром $D_н$ в мм	(2) Высота h в мм	(3) Ширина A в мм		(4) Длина Б в мм	
		(5) для осевого перемещения	(6) для осевого и поперечного перемещения	(5) для осевого перемещения	(6) для осевого и поперечного перемещения
273	100	170	200	300	150
	150				
325—478	100	200			200
	150				
	200				
529—1020	100	260	400	300	250
	150			400	
	200				

Key: (1). Lower tube by outside diameter ___ in mm. (2). Height/altitude h in mm. (3). Width A in mm. (4). Length B in mm. (5). for axial displacement. (6). for axial and cross travel.

Table 3.15. Distances between the surfaces of tubes H depending on combination h and h_1.

(1) A в мм	100	150	200	100	150	200
(1) h_1 в мм	90	90	90	140	140	140
(1) H в мм	190	240	290	240	290	340

Key: (1). in mm.

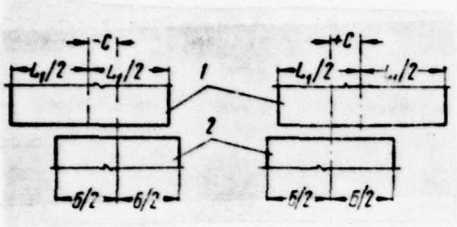


Fig. 3.25. Displacement of the axle/axis of sliding bases of upper tubes relative to the axle/axis of supporting structures during installation. 1 - housing of sliding base of upper tube; 2 - supporting structure on lower tube; L - length of the housing of sliding base of upper tube; B - length of supporting structure; ±C - displacement of the axle/axis of sliding base of upper tube relative to the axle/axis supporting structure during installation.

Page 44.

The amount of the displacement of the axle/axis of sliding bases of upper tubes relative to the axle/axis supporting structures at installation (Fig. 3.25) is determined depending on the points (see Fig. 3.24) in question by the formulas:

(for points 1 and 5 with sign "+"; for points 2 and 4 with sign "-")

$$C = \pm \frac{L(\delta_н - \delta_в)}{4} \text{ мм}; \qquad (3.7)$$

(for point 6 with sign "+"; for point 3 with sign "-")

$$C = \pm \frac{L(\delta_н + \delta_в)}{2} \text{ мм}. \qquad (3.8)$$

For remaining supports the displacement is accepted the same as for calculated. At angles of rotation, the displacement of supports during installation is not provided for.

During the construction of supporting structures, the length of bearing surface for the axial displacements of sliding bases of upper conduit/manifolds can be determined by formulas (3.3) and (3.4).

The dimensions of the U-shaped compensators of lower and upper conduit/manifolds accept identical and equal maximum of those who were obtained the calculation for each conduit/manifold. When determining is the compensator of upper conduit/manifold, one should perform its calculation without taking into account of the adjacent it arms

(instead of 40 D_y for the common cases).

The length of the compensating arms of the angles of rotation of conduit/manifolds calculates for strength and check on the taken dimensions of supports on the basis of the permissible for these supports thermal displacements and with the observance of the condition so that during the side displacement support would not reach the edge of supporting structure from each side not less than on 20-25 mm.

Preliminary bracing at angles of rotation is not provided for.

With the laying of pipeline "tube on tube" is necessary the check calculations of lower conduit/manifold for strength taking into account the increment load of upper conduit/manifold.

Page 45.

Chapter 4.

Fittings, flange joints, gasket and corrugated compensators.

4.1. General considerations.

Fittings, flanges, plug/silencers and compensators select depending on temperature and form of heat carrier (pairs, water) and of conditional pressure.

For thermal grid/networks is applied steel and cast iron reinforcement with flanged and coupling leads, and also with ends hearth welding tubes.

The application/use of a reinforcement with coupling leads is allow/assumed on conduit/manifolds with conditional pressure $P_y \leq 16$ kg/cm² and t ≤ 225°C, basically on air-escape cocks and drainages.

Application/use of a reinforcement depending on the material of housing is given in Table 4.1.

Cast iron reinforcement must be shielded from those who bend and as far as possible of axial loads.

In thermal grid/networks are applied the steel undischarged gasket compensators. Begins to be introduced the new construction of the corrugated compensators: general-purpose of the hinged type and axial.

4.2. Close fitting valve, return and suction valves.

Close fitting valve is establish/installed for the disconnection/cutoff of submains, the disconnection/cutoff of the cross connections of the partitioning of main lines to the time of repair and flushing, constant and

starting/launching drainage of steam lines, descent of water from conduit/manifolds, air exhaust with the filling of conduit/manifolds with water or with the descent of water.

Depending on designation/purpose and operating mode, the close fitting valve must be either completely opened or it is closed. The use of a close fitting valve for the flow-rate control of heat carrier or pressure is not allow/assumed, since occurs the errosive destruction of the parts of cutoff devices and it is not provided sufficient density of disconnection/cutoff in closed state.

As close fitting valve are applied the catches and the valve/gates. Catches have smaller hydraulic resistance. On the sections, which require especially reliable and dense disconnection/cutoff (drainages, cross connections), one should establish/install the valve/gates, which ensure the high density of disconnection/cutoff.

Catches as diameter 350 mm and more must have an enclosure. If in the construction of catch enclosure is not provided for, is arranged special bypass line. the diameter of enclosures is accepted according to Table 4.2.

In conduit/manifolds by the internal diameter 500 mm and more are establish/installed the catches with electric drive. For conduit/manifolds by the internal diameter 600 mm and is above allow/assumed the setting up of the catches of smaller diameter with device on the course of water of converging nozzle sections and diffusers. If is possible the bilateral motion of water (ring circuit), then instead of the converging nozzle section is establish/installed the inlet diffuser. The size/dimensions of transfer/transitions to catches are given in Table 4.3.

Table 4.1. Application/use of a reinforcement depending on the material of housing.

(1) Материал корпуса арматуры	(2) Водяные тепловые сети и конденсатопроводы	(3) Паропроводы
(4) Сталь — с	$P_{раб} > 9$ (5) кгс/см²	$t > 300°C$ (6) независимо от давления и диаметра
	$D_y > 250$ мм (7) независимо от давления	$P_{раб} > 9$ (5) кгс/см² и $D_y > 200$ мм независимо (8) от температуры
(9) Ковкий чугун — кч	$P_{раб} < 9$ (5) кгс/см²	$D_y < 200$ мм (6) и при (10) $P_{раб} < 9$ кгс/см² и $t < 300°C$
	$D_y < 250$ мм (7) независимо от давления	
(11) Серый чугун — ч	$P_{раб} < 9$ (5) кгс/см² и $D_y < 200$ мм	Не применяется (12)

CU = and J

Notes: 1. With above-grade packing is not allow/assumed the application/use of a reinforcement from malleable cast iron, if the calculated for a heating temperature of surrounding air is below -30°C, of the gray - below -10°C.

2. Steel reinforcement is applied also by instead of

cast iron, if on local conditions the application/use of cast iron reinforcement is not allow/assumed (at above-grade packing and temperature of surrounding air lower than permissible for cast iron, in presence of lateral forces, etc.).

3. Reinforcement from gray cast iron it is allow/assumed to apply in drainage conduit/manifolds, which discharge water from camera/chambers and channels of thermal grid/networks.

Key: (1). Material of the housing of reinforcement. (2). Water thermal grid/networks and condensers. (3). Steam lines. (4). Steel - s. (5). kg/cm². (6). independent of pressure and diameter. (7). mm independent of pressure. (8). kg/cm² (8) mm independent of temperature. (9). Malleable cast iron - KCh. (10). mm and with. (11). Gray cast iron - ch. (12). It is not applied.

Table 4.2. Diameters of enclosures for catches.

(1) Условный проход задвижки D_y в мм	350	400	500	600	800	1000	1200
(2) Условный проход обвода D_{y1} в мм	50	80	50	50	80	100	125

Key: (1). The internal diameter of catch D_y in mm. (2). The internal diameter of enclosure D_{y1} in mm.

Page 46.

Basic parameters of catches, valve/gates, return and suction valves on the "catolog of pipeline accessories" are given in table 4.4-4.7.

4.3. Flange joints.

Flange joints apply for union coupling with reinforcement, the connection of the reinforcement between themselves and the settings-up of measuring diaphragms.

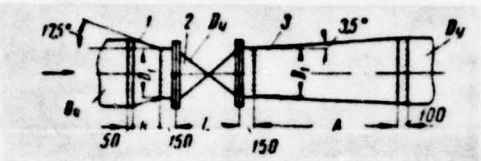


Fig. 4.1. Transitions in pipelines to valves. 1 - converging tube; 2 - valve; 3 - diffuser.

Table 4.3. Dimensions of transitions to valves (Fig. 4.1).

(1) Условный проход трубопровода D_y в мм	(2) Условный проход задвижки D_y в мм	(3) Размеры в мм			
		D_1	L	K	A
600	500	530	700	160	820
700	500	530	700	300	1550
800	600	630	800	300	1550
900	600	630	800	460	2400
1000	800	820	1000	320	1650
1200	800	820	1000	640	3300

Key: (1) condional opening of pipeline D_y in mm.; (2) conditional opening of valve D_y in mm.; (3) dimensions in mm.

Table 4.4. the basic parameters of catches.

(1) Условное давление P_y в кгс/см²	(2) Теплоноситель	(3) Температура теплоносителя в °С не более	(4) Рабочее положение (см. условные обозначения)	(5) Условное обозначение	(10) Условный проход D_y в мм: 50	80	100	125	150	200	250	250/150	250/200	300	350	400	400/300	500	500/400	600	800	1000	1000/800	1200
10	(7) Вода, пар	225	1; 2; 3	30ч66р (10)	+	+	+	+	+	+	+	–	–	+	+	+	–	–	–	–	–	–	–	–
			1; 4* 5*	30ч906бр	–	–	+	+	+	+	+	–	–	+	–	+	–	–	–	–	–	–	–	–
			(8) любое	30ч96р	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	(11) Вода	100	1; 2; 3	30ч15бр	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	+	+	–	–	–
			1; 4; 5	30ч315бр	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+
			1; 2; 6	30ч515бр	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	+	+	–	–
			1	30ч915бр	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	+	+	+	–	+
		120		30ч930бр	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+
25	(16) Пар	450	1; 2; 3	30с9ст (14)	–	–	+	–	+	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–
	(17) Пар, вода	300	1; 4	30с327нж (15)	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	+	+	–	–	–
				30с927нж	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	+	+	–	–	–
			1; 2; 3	30с64нж	–	–	+	–	+	+	–	–	+	–	–	–	–	–	–	–	–	–	–	–
			1; 2; 6	30с564нж	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–
			1; 4; 5	30с964нж	–	–	–	–	+	+	–	–	+	+	–	–	–	–	–	–	–	–	+	–
	(12) Пар	400	1; 2; 3	30с72нт	–	–	+	–	+	+	–	–	+	–	–	–	–	–	–	–	–	–	–	–
			1; 2	30с972нт (16)	–	–	–	–	–	–	–	–	–	+	–	–	+	–	+	–	–	–	–	–
			1	30с972нт	–	–	–	–	+	+	–	–	+	+	–	–	+	–	+	–	–	–	–	–
64	(7) Вода, пар	300	1; 2; 3	30с66нж (15)	–	–	–	–	–	+	+	–	–	+	–	–	–	–	–	–	–	–	–	–
			1; 4	30с966нж (15)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–
	(12) Пар	400	1; 2; 3	30с74нт (16)	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–
			1	30с974нт	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–
	(7) Вода, пар	300	1; 2; 3	30с75нж (16)	–	–	–	–	+	+	–	–	+	+	–	–	–	–	–	–	–	–	–	–
			1	30с375нж	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–
			1; 4	30с975нж	–	–	–	–	–	+	–	–	+	–	–	–	–	–	–	–	–	–	–	–
			1; 2; 3	30с76нж (16)	+	+	+	–	+	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–
				30с576нж	–	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–
$P_{раб} < 14$		225	1; 2; 3	31с0036р	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
$P_{раб} < 13$				31с4036р (16)	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–
$P_{раб} < 10$				31с4036р	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–

The conventional designations of operating position.

1. Catches establish/install in horizontal conduit/manifold in position by "flywheel upward", by "drive upward", by "reducer upward" or by "hinge joint upward" (with vertical run of shaft).

2. Catches are establish/installed in horizontal conduit/manifold in position "to fin/edge" (with horizontal arrangement of shaft).

3. Catches are establish/installed in vertical conduit/manifold in position "prone" (with horizontal arrangement of shaft).

4. Catches are establish/installed in horizontal conduit/manifold in position "to fin/edge", in this case reducer or electric drive must be transposed to position by worm down.

5. Catches are establish/installed in vertical conduit/manifold in position "prone", in this case reducer or electric drive must be transposed to position by worm down.

6. Catches are establish/installed in vertical conduit/manifold in position "prone", during appropriate rearrangement of reducer.

Notes: 1. The operating positions of the gates 30ch906br, noted by chain wheel, are related only to gates $D_y > 200$ mm.

2. Catches [gates] with sealing surface from brass or bronze 30s327br, 30s927br, 30s646br, 30s564br, 30s964br, 30s75br, 30s375br, 30s975br, 30s76br, 30s576br are applied at temperature of heat carrier not more than 225°C instead of these catches, indicated in table with sealing surface made of stainless steel (nzh).

3. Catches with sealing surface made of stainless steel 30s72nzh, 30s572nzh, 30s972nzh, 30s974nzh are applied at temperature of heat carrier not more than 300°C instead of these catches, indicated in the table with sealing surface made of nitrided steel (nt).

4. Gates with hand drive it is allow/assumed to set

in any intermediate position in the range 90° between vertical position of shaft and position of shaft "to fin/edge". The setting up of catches with the slope/inclination of shaft is lower than the horizontal is not allowed.

Key: (1). Conditional pressure P_y in kg/cm². (2). Heat carrier. (3). Temperature of heat carrier in °C not more. (4). Operating position (see conventional designations). (5). the conventional designations. (6). The internal diameter D_y in mm. (7). Water, steam. (8). any. (9). h. (10). br. (11). Water. (12). Steam. (13). s. (14). st. (15). nzh. (16). nt. (17). Steam, water.

Page 48.

Table 4.5. Basic parameters of valves.

(1) Условное давление в кгс/см²	(2) Теплоноситель	Температура теплоносителя в °С не более	(4) Условное обозначение	(5) Условный проход D_y в мм											
				15	20	25	32	40	50	70	80	100	125	150	200
16	(6) Вода, пар	225	15кч26р (9)	–	–	–	–	–	–	+	–	–	–	–	–
			15ч83р (6) (8)	+	+	+	+	+	+	+	+	–	–	–	–
16	(6) Вода, пар	225	15кч96р (6) (8)	–	–	+	+	+	+	–	–	–	–	–	–
			15ч146р (9) (8)	–	–	–	–	–	–	+	+	+	+	+	+
	(10) Пар		15кч186р (7) (8)	+	+	+	+	+	+	–	–	–	–	–	–
	(11) Вода, насыщенный пар	180	15кч99 (1) (12)	+	+	+	+	+	+	–	–	–	–	–	–
			15кч199 (1) (2)	–	–	+	+	+	+	–	–	–	–	–	–
	(10) Пар	225	15кч196р (1) (8)	–	–	+	+	+	+	–	–	–	–	–	–
	(6) Вода, пар		15с58бр (14) (2)	–	–	–	–	–	+	–	+	+	–	–	–
	(13) Перегретый пар	425	15с58нж (2) (15)	–	–	–	–	–	+	–	+	+	–	–	–
25	(1) Вода, насыщенный пар	225	15кч166р (1) (2)	–	–	+	+	+	+	+	+	–	–	–	–
	(13) Перегретый пар	300	15кч16нж (4) (15)	–	–	+	+	+	+	+	+	–	–	–	–
	(11) Насыщенный пар	225	15кч9166р (7) (4)	–	–	–	–	–	+	–	–	–	–	–	–
	(13) Перегретый пар	300	15кч916нж (7) (15)	–	–	–	–	–	+	–	–	–	–	–	–
	(6) Вода, пар	225	15кч226р (7) (8)	–	–	–	–	+	+	+	+	–	–	–	–
40	(10) Пар	300	15кч22нж (7) (15)	–	–	–	–	+	+	+	+	–	–	–	–
	(6) Вода, пар	225	15с226р (9) (8)	–	–	–	–	+	+	+	+	+	+	+	+
	(13) Перегретый пар	425	15с22нж (9) (15)	–	–	–	–	+	+	+	+	+	+	+	+
	(10) Пар	480	15с28нж (11) (15)	+	+	+	–	–	–	–	–	–	–	–	–
64	(10) Пар	400	15с27нж1 (14) (15)	+	+	+	+	+	–	–	–	–	–	–	–

Note. Valve/gate 15kch916 is establish/installed in horizontal conduit/manifold in vertical position by electric drive upward, remaining valve/gates are set in any position.

Key: (1). conditional pressure in kg/cm². (2). Heat carrier. (3). The temperature of heat carrier in °C is not more. (4). The conventional designations. (5). the internal diameter D_y in mm. (6). Water, steam. (7). kch. (8). br. (9). h. (10). Pairs. (11). Water, the saturated steam. (12). e. (13). The superheated steam. (14). s. (15). nzh. (16). The saturated steam.

Page 49.

Table 4.6. The basic parameters of return hinged valves.

(1) Условное давление в кгс/см²	(2) Теплоноситель	(3) Температура теплоносителя в °С не более	(5) Условное обозначение	(6) Условный проход D_y в мм													
				50	70	80	100	125	150	200	250	300	400	500	600	800	1000
10	(4) Вода, пар	200	19ч16р (7) (8)	–	–	–	–	–	–	–	–	–	–	–	+	–	–
		225	19ч16р (7) (8)	–	–	–	–	–	–	+	+	+	+	+	–	–	–
			19ч16р1 (7) (9)	–	–	–	–	–	–	+	+	+	–	–	–	–	–
16	(4) Вода, пар	225	19ч16р (7) (8)	+	+	+	+	+	+	–	–	–	–	–	–	–	–
			19ч16р1 (7) (9)	+	+	+	+	+	+	–	–	–	–	–	–	–	–
25	(4) Вода	300	19с15нж (10) (11)	–	–	–	–	–	–	–	–	–	–	–	+	–	–
			19с24нж (10) (11)	–	–	–	–	–	–	–	–	–	–	–	–	+	+
40	(4) Вода, пар	425	19с17нж (10) (11)	+	–	+	+	–	+	+	–	+	+	–	+	–	–

Note. The valves 19ch16br and 19s17nzh establish/install in horizontal conduit/manifold by the cap/cover above and in vertical conduit/manifold - by disk down; valve 19ch16br1 establish/installs in horizontal or vertical conduit/manifold by disk down; the valve 19s15nzh establish/installs in horizontal conduit/manifold by cap/cover upward, and the valve 19s24nzh - by a hatch upward.

Key: (1). Conditional pressure in kg/cm². (2). Heat carrier. (3). The temperature of heat carrier in °C is not more. (4). Water, pairs. (5). the conventional designations. (6). The internal diameter D_y in mm. (7). ch. (8). br. (9). Water. (10). s. (11). nzh.

Table 4.7. Basic parameters of inverse left and suction valves.

(1) Условное давление в кгс/см²	(2) Теплоноситель	(3) Температура теплоносителя в °С не более	(4) Условное обозначение	(5) Условный проход D_y в мм														
				15	20	25	32	40	50	70	80	100	125	150	200	250	300	400
2,5	(8) Вода	50	(7)(8) 16ч40р	–	–	–	–	–	+	–	+	+	–	+	+	+	+	
16	(9) Вода, пар	225	(7)(10) 16ч16р	+	+	+	+	+	+	–	–	–	–	–	–	–	–	–
			(7)(10) 16ч26р	–	–	–	–	–	–	+	+	–	–	–	–	–	–	–
			(7)(10) 16ч36р	–	–	+	+	+	+	–	–	–	–	–	–	–	–	–
			(7)(10) 16ч66р	–	–	–	–	–	–	+	+	+	+	+	+	–	–	–
			(11)(10) 16кч11бр	+	+	+	+	+	+	–	–	–	–	–	–	–	–	–
25	(9) Вода, пар	225	(11)(10) 16кч9бр	–	–	+	+	+	+	+	+	–	–	–	–	–	–	–
	(12) Пар	300	(11)(13) 16кч9нж	–	–	+	+	+	+	+	+	–	–	–	–	–	–	–
40	(9) Вода, пар	300	(11)(13) 16с13нж	–	–	–	–	–	–	+	+	+	+	+	+	–	–	–

Note. The valve 16ch40r are establish/installed in the end of the vertical conduit/manifold by grid down, and remaining valves - in horizontal pipeline with the cap/cover above.

Key: (1). Conditional pressure in kg/cm². (2). Heat carrier. (3). The temperature of heat carrier in °C is not more. (4). The conventional designations. (5). the internal diameter D_y in mm. (6). Water. (7). h. (8). r. (9). Water, steam. (10). br. (11). kch. (12). Steam. (13). nzh.

Page 50.

In thermal grid/networks are applied the smooth sealing surfaces of flanges (see Fig. 4.2, 4.3, 4.4) and with projection or indentation (see Fig. 4.5) in accordance with GOST 6971-54 *.

The smooth sealing surfaces of flanges to the conditional pressure $P_y \leq 25$ kg/cm² have the coupling projection f, which enters in the calculated thickness of flange b. The sealing surfaces of flanges on $P_y = 40$ and 64 kg/cm² besides projection f have projection f_1 whose value

is given over the calculated thickness b, or indentation f_2 whose value enters in the calculated thickness b. When, on the connecting flange, the reinforcement of indentation is present, the flange of conduit/manifold must be accepted with projection, and vice versa. The flanges of reinforcement are manufactured only with indentation, if with the order of reinforcement is not stipulated projection.

For connection with the reinforcement whose connecting flanges are carried out with smooth sealing surface (only with the coupling projection f) on P_y=40 kg/cm² or with completely smooth sealing surface (without projection f) on P_y =16.25 and 40 kg/cm², the reciprocal flanges of conduit/manifolds are applied with smooth sealing surface, which one should specify in specifications. For union coupling with reinforcement in that which coincides P_y are applied the flanges on Table 4.8.

Fastening materials for flange joints are applied:

with P_y=2.5; 6; 10; 16 and 25 kg/cm² - bolts semifinished with hex head with basic metric thread according to GOST 7798-62, nuts semifinished hexahedral according to GOST 5915-62;

with $P_y=40$ and 64 kg/cm² - pin bilateral with the metric thread with rapidly according to GOST 9066-59; nut pure/clean hexahedral according to GOST 9064-59, washers pure/clean according to GOST 6959-54 *.

The mark/brands of steel for flanges and fastening materials are given in Table 4.9.

For the packing/seal of flange joints, are applied pads of Paronit according to GOST 481-58, impregnated with machine oil and lubricated by graphite, thickness 1-1.5 mm.

For the flange joints of conduit/manifolds with flanged reinforcement at the coinciding conditional pressure of tube and reinforcements, are comprised table 4.10-4.13, in which is given the set of flanges, fastening materials and packing depending on the internal diameters of conduit/manifolds.

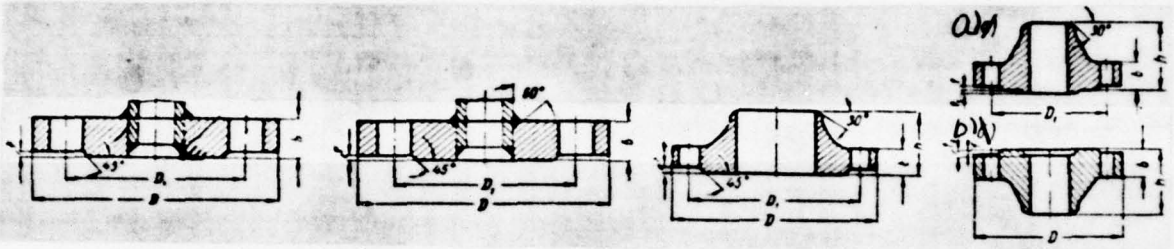
Table 4.8. Flanges (Fig. 4.2, 4.3, 4.4, 4.5).

(1) Тип и ГОСТ фланца	(2) Температура теплоносителя в °С	(3) Условный проход D_y в мм при условном давлении P_y в кгс/см²						
		2.5	6	10	16	25	40	64
(4) Фланцы стальные плоские приварные по ГОСТ 1255–54*	(5) До 300	(6) От 15 до 1200	(6) От 15 до 1000	(6) От 15 до 600	(6) От 15 до 600	(6) От 15 до 500	–	–
(7) Фланцы стальные приварные в стык по ГОСТ 1260–54*	. 425	(6) От 15 до 1200	(6) От 15 до 1200	(6) От 15 до 1200	(6) От 15 до 1200	(6) От 15 до 800	–	–
(8) То же, с выступом или впадиной	. 425	–	–	–	–	–	(6) От 15 до 500	(6) От 15 до 400

Note. Flanges according to GOST 1.260-54 * to the internal diameters for which there are flanges according to GOST 1255-54 *, at the temperature of heat carrier to 300°C, are applied when the wall thickness of tubes for welding of flat/plane flanges is greater the wall thickness of basic conduit/manifold.

Key: (1). Type and GOST of flange. (2). Temperature of heat carrier in °C. (3). The internal diameter D_y in mm at a conditional pressure P_y in kg/cm². (4). Flanges steel planes are welded according to GOST. (5). To. (6). From.

Flanges steel welded into joint on. (8). The same, with projection or indentation.



4.2. 4.3. 4.4. 4.5.

Fig. 4.2. flange steel plane welded on P_y=2,5; 6 and 10 kg/cm².

Fig. 4.3. Flange steel plane welded on P_y=16 and 25 kg/cm².

Fig. 4.4. Flange steel welded into joint to P_y=2,5; 6; 10; 16; and 25 kg/cm².

Fig. 4.5. Flange from steel welded into joint on P_y=40 and 64 kg/cm². a) with projection; b) with indentation.

Pages 51 and 52.

Table 4.9. Mark/brands of steel, used for the flange joints of tubes.

(1) Наименование детали	(2) Условное давление P_y в кгс/см²	(3) Температура теплоносителя в °С, до			
		300	350	400	425
(4) Фланцы стальные плоские приварные	2,5; 6; 10; 16; 25	Ст. 3; Ст. 4; МСт. 3 и МСт. 4	—	—	—
(5) Фланцы стальные приварные в стык	2,5; 6; 10; 16; 25	МСт. 3; МСт. 4; Ст. 3 и Ст. 4	20 и 25		
	40; 64	20 и 25			
(6) Заглушки фланцевые плоские стальные	2,5; 6; 10; 16; 25	Ст. 3 и Ст. 4	20 и 25		
	40; 64	20 и 25			
(7) Болты получистые с шестигранной головкой	2,5; 6; 10; 16; 25	Ст. 3*; Ст. 4 и Ст. 5		25 и 35	
(8) Шпильки двухсторонние	40; 64			35 и 40	
(9) Гайки чистые шестигранные	2,5; 6; 10; 16; 25	Ст. 3 и Ст. 4		20 и 25	
	40; 64	25 и 30			
(10) Шайбы чистые	40; 64	Ст. 3; 20			

[И = and]

Notes: 1. Steel of brands HSt..3, HSt.4, St.3, St.4 and St.5 - according to GOST 380-60; 20, 25 and 35 - according to GOST 1050-60.

2. Chain wheel designated trademark of steel bolts for flanges according to GOST 1255-54 *.

Key: (1). Designation of part. (2). Conditional pressure P_y in kg/cm². (3). Temperature of heat carrier in °C, to. (4). Flanges steel planes are welded. (5). Flanges steel welded into joint. (6). Plug/silencers flanged planes are steel. (7). Bolts are semifinished with hex head. (8). Pins are bilateral. (9). Nuts pure/clean hexahedral. (10). Washers are pure/clean.

Table 4.10. Flange joints on kg/cm².

Table 4.10. Flange joints on P_y = 10 Kg/cm²

(1) D_y трубы в мм	(6) Фланцы: (2) наружный диаметр D в мм	(3) диаметр болтовой окружности D_1 в мм	(4) толщина b в мм	(5) вес одного фланца в кг	(7) ГОСТ	(9) Крепежные детали на одно соединение: (8) резьба	(10) болты по ГОСТ 7798—62: (13) длина в мм: (14) болта	(15) резьбы	количество в шт.	(16) Вес в кг: (18) одного болта	(19) суммарный	(11) гайки по ГОСТ 5915—62: количество в шт.	(17) вес в кг: (8) одной гайки	(9) суммарный	(12) Прокладки паронитовые: (28) наружный диаметр	(29) внутренний диаметр	(30) вес одной прокладки в кг
															в мм		
15	95	65	12	0.511	1255—54*	M12	40	30	4	0.051	0.204	4	0.0172	0.0688	45	18	0.004
20	105	75		0.748			40			0.051	0.204				57	27	0.006
25	115	85	14	0.89			45			0.055	0.22		0.0172	0.0688	65	33	0.007
32	135	100	16	1.40		M16	50	38		0.11	0.44		0.0335	0.134	75	40	0.01
40	145	110	18	1.71			55			0.117	0.468				87	49	0.012
50	160	125	18	2.09											102	57	0.017
70	180	145	20	2.84			60			0.125	0.5				120	80	0.019
80	195	160	20	3.24											138	89	0.026
100	215	180	22	4.01			65		8	0.133	1.064	8	0.0335	0.268	158	108	0.031
125	245	210	24	5.40			70			0.141	1.128				188	133	0.042
150	280	240	24	6.12											212	159	0.047
175	310	270	24	7.44		M20	75	46		0.249	1.992		1.0645	0.516	242	177	0.052
200	335	295	24	8.24											268	220	0.059
250	390	350	26	10.7			75		12	0.249	2.99	12	0.0645	0.775	320	270	0.071
300	440	400	28	12.9		M20	80	46		0.261	3.13				365	325	0.073
350	500	460	28	15.9					16	0.261	4.17	16	0.0645	1.03	420	378	0.112
400	565	515	30	21.8	1255—54*	M22	85	50		0.323	5.18		0.0731	1.17	482	426	0.13
450	615	565	30	24.4					20	0.323	6.46	20	0.0731	1.462	532	477	0.137
500	670	620	32	27.7			90			0.338	6.76				585	530	0.162
600	780	725	36	39.4						0.609	12.2		0.166	3.32	685	630	0.188
700	895	840	30	69.5		M27	100	60	24	0.609	14.6	24	0.166	3.98	800	692	0.4
800	1010	950	32	93.95	1260—54*		110			0.834	20		0.231	5.55	905	792	0.475
900	1110	1050	34	111.9		M30	115	66	28	0.861	24.2	28	0.231	6.48	1005	892	0.525
1000	1220	1160	34	133.6			120			0.889	24.9				1115	992	0.625

Key: (1). tube in mm. (2). the outside diameter D b mm. (3). the diameter of the bolt circumference D_1 in mm. (4). thickness b in mm. (5). the weight of one flange in kg. (6). Flanges. (7). GOST. (8). thread. (9). Fasteners for one connection. (10). bolts on. (11). nut according to GOST. (12). Packing are Paronit. (13). length in mm. (14). bolt. (15). thread. (16). a quantity in pcs. (17). Weight in kg. (18). one nut. (19). total. (20). bore. (21). Weight of one packing in kg.

Page 53.

When the conditional pressures of reinforcement and conduit/manifolds do not coincide (in the absence of the corresponding reinforcement), it is possible to apply flanges into smaller conditional pressure, but with the same coupling dimensions. the possibility of this replacement at different conditional pressures and passes of conduit/manifolds is reflected in Table 4.14.

Table 4.11. Flange joints on P_y – 16 kg/cm².

(1) D_y трубы в мм	(2) Фланцы: наружный диаметр D в мм	(3) диаметр болтовой окружности D_1 в мм	(4) толщина b в мм	(5) вес одного фланца в кг	(7) ГОСТ	(8) Крепежные детали на одно соединение: резьба	(9) Болты по ГОСТ 7798–62: (13) длина в мм: (14) болта	(15) резьбы	(16) количество в шт.	(17) вес в кг: одного болта	(18) суммарный	(11) Гайки по ГОСТ 5915–62: (6) количество в шт.	(10) вес в кг: (19) одной гайки	(20) суммарный	(12) Прокладки паронитовые: наружний диаметр	внутренний диаметр	(21) вес одной прокладки в кг
															в мм		
15	95	65	14	0.711	1255–54*	M12	45	30	4	0,055	0,22	4	0,0172	0,0688	45	18	0,004
20	105	75		0,867			45			0,055	0,22				57	27	0,006
25	115	85	18	1,174			50			0,059	0,238		0,0172	0,0688	65	33	0,007
32	135	100	18	1,6		M16	55	38		0,117	0,468		0,0335	0,134	75	40	0,01
40	145	110	20	2			60			0,125	0,5				87	49	0,012
50	160	125	22	2,61			65			0,133	0,532				102	57	0,017
70	180	145	24	3,45											120	80	0,019
80	195	160	24	3,71			65			0,133	1,064				138	89	0,026
100	215	180	26	4,8		M16	70	38		0,141	1,128		0,0335	0,268	158	108	0,031
125	245	210	28	6,47			75		8	0,149	1,19	8			188	133	0,042
150	280	240	28	7,92		M20	80	46		0,261	2,088		0,0645	0,516	212	159	0,047
175	310	270	28	8,81						0,261	2,088				242	194	0,052
200	335	295	30	10,1			85			0,273	3,28		0,0645	0,774	268	220	0,059
250	405	355	32	15,7		M22	90	50	12	0,338	4,17	12	0,0731	0,876	320	270	0,071
300	460	410	32	18,1											378	325	0,096
350	520	470	34	23,3			95		16	0,352	5,63	16	0,0731	1,17	420	378	0,112
400	580	525	38	31		M27	110	60		0,65	10,4		0,166	2,66	482	426	0,13
450	640	585	42	40,2			120			0,625	13,9		0,166	3,32	550	477	0,186
500	705	650	48	55,1		M30	130	66	20	0,944	18,9	20	0,231	4 62	610	530	0,233
600	840	770	50	80,3						1,508	30,2		0,383	7,66	720	630	0,304
700	910	840	48	102,3	1260–54*	M36	140	78	24	1,508	36,2	24	0,383	9,2	790	692	0,363
800	1020	950	50	125,4											900	792	0,455
900	1120	1050	52	150,6			150		28	1,887	44,5	28	0,383	10.7	1000	892	0,51
1000	1255	1170	54	207,3		M42	160	96		2,369	66,5		0,617	17,2	1110	992	0,62

Key: (1). tube in mm. (2). the outside diameter D in mm. (3). the diameter of the bolt circumference D_1 in mm. (4). thickness b in mm. (5). the weight of one flange in kg. (6). flanges. (7). GOST. (8). thread. (9). Fasteners for one connection. (10). bolts on. (11). nut according to GOST. (12). Packing are Paronit. (13). length in mm. (14). bolt. (15). thread. (16). a quantity in pcs. (17). one bolt. (18). total. (19). one nut. (20). bore. (21). the weight of one packing in kg.

Page 54.

Table 4.12. Flange joints on $P_y = 25$ kg/cm².

(1) D_y трубы в мм	(2) Фланцы: (5) наружный диаметр D в мм	(6) диаметр болтовой окружности D_1 в мм	(7) толщина b в мм	(8) вес одного фланца в кг	(9) ГОСТ	(3) Крепежные детали на одно соединение: (10) резьба	болты по ГОСТ 7798-62: (11) длина в мм: (12) болта	(13) резьба	(14) количество в шт.	(15) вес в кг: одного болта	сумм.	(16) гайки по ГОСТ 5915-62: количество в шт.	(17) вес в кг: одной гайки	сумм.	(4) Прокладки паронитовые: (5) наружный диаметр	(20) внутренний диаметр	в мм: (21) вес одной прокладки в кг
15	95	65	16	0,804			45			0,055	0,22				45	18	0,004
20	105	75		0,985		M12	45	30		0,055	0,22		0,0172	0,0688	57	27	0,006
25	115	85	18	1,174			50		4	0,058	0,232	4	0,0172	0,0688	65	33	0,007
32	135	100	20	1,96			60			0,125	0,5				75	40	0,01
40	145	110	22	2,6						0,133	0,532		0,0335	0,164	87	49	0,012
50	160	125	24	2,71		M16	65	38							102	57	0,017
70	180	145	24	3,22						0,133	1,064		0,0335	0,268	120	80	0,019
80	195	160	26	4,06			70			0,141	1,128				138	89	0,026
100	230	190	28	6		M20	80	46	8	0,261	2,088	8	0,0645	0,516	158	108	0,031
125	270	220	30	8,26											188	133	0,042
150	300	250	30	10,4	1255—54*		85			0,323	2,584		0,0731	0,585	212	159	0,047
175	330	280	32	11,9		M22	90	50		0,338	4,17				248	194	0,056
200	360	310	32	14,5			95		12	0,352	4,22	12	0,0731	0,876	278	220	0,072
250	425	370	34	18,9			100			0,609	7,3		0,166	1,99	335	270	0,094
300	485	430	36	26,8		M27	110	60		0,65	10,41		0,166	2,66	390	320	0,117
350	550	490	42	34,35					16			16			450	370	0,153
400	610	550	44	44,9		M30	120	66		0,887	14,2		0,231	3,7	535	426	0,183
450	670	600	48	51,92			130			0,944	18,44		0,231	4,62	550	477	0,186
500	730	660	52	67,3			140		20	1,508	30,16	20			610	530	0,233
600	840	770	54	125,6		M36	150	78		1,587	31,74		0,383	7,66	830	630	0,75
700	955	875	58	170,8	1260—54*										935	692	0,955
800	1070	990	60	228,7		M42	170	96	24	2,477	29,3	24	0,617	14,8	1050	792	1,15

Key: (1). tube in mm. (2). flanges. (3). Fasteners for one connection. (4). Packing are Paronit. (5). the outside diameter D in mm. (6). the diameter of the bolt circumference D_1 in mm. (7). thickness b in mm. (8). the weight of one flange in kg. (9). GOST. (10). thread. (11). length in mm. (12). bolt. (13). thread. (14). a quantity in pcs. (15). weight in kg. (16). one bolt. (17). total. (18). a quantity in pcs. (19). nut according to GOST. (20). bore. (21). the weight of one packing in kg.

Page 55.

Table 4.13. Flange joints on P_y=40 kg/cm².

(1) b_y трубы в мм	(2) Фланцы А и Б по ГОСТ 1255–54* (3) наружный диаметр D в мм	(4) диаметр болтовой окружности D_1 в мм	(5) толщина b в мм	(6) Размеры фланца в мм (7) с выступом (фиг. А)	(8) с впадиной (фиг. Б)	(9) Крепежные детали на одно соединение (11) резьба	(10) шпильки по ГОСТ 9.65–59 (14) длина в мм	(15) резьба	(16) количество в шт.	(17) вес в кг одной шпильки	(18) суммарный	(19) гайки по ГОСТ 9461–59 (16) количество в шт.	(3) вес в кг (20) одной гайки	(8) суммарный	(21) шайбы по ГОСТ 9649–61* (16) количество в шт.	(13) вес в кг (22) одной шайбы	(18) суммарный	(23) Присоединительные размеры (24) наружный диаметр	(25) внутренний диаметр (27) в мм	(26) вес пары фланцев в кг
15	95	65	16	0,867	0,739	M12	70	25	4	0,055	0,22	8	0,019	0,152	8	0,006	0,048	39	14	0,003
20	105	75		1,02	0,919													50	20	0,005
25	115	85	16	1,24	1,11		70	25		0,055	0,22		0,019	0,152		0,006	0,024	57	27	0,006
32	135	100	18	1,92	1,76	M16	90	32		0,106	0,504		0,039	0,312		0,014	0,112	65	33	0,007
40	145	110	18	2,21	2													75	41	0,01
50	160	125	20	2,92	2,68													87	49	0,012
70	180	145	22	3,94	3,58		100	32		0,142	1,136		0,039	0,624		0,014	0,224	109	66	0,017
80	195	160	24	5,02	4,64													120	80	0,019
100	230	190	26	7,53	6,97	M20	110	40	8	0,241	1,928	16	0,077	1,232	16	0,024	0,384	149	97	0,03
125	270	220	28	10,3	9,44	M22	120	45		0,321	2,568		0,093	1,488		0,03	0,48	175	123	0,037
150	300	250	30	13,8	12,6		130	45		0,35	2,8							203	149	0,046
175	350	295	36	21,4	20,2	M27	150	55	12	0,603	7,236	24	0,194	4,656	24	0,052	1,248	233	174	0,078
200	375	320	34	25	23,6													259	204	0,08
250	445	385	42	31,7	35		170	60		0,845	10,14		0,277	6,648			1,752	312	250	0,089
300	510	450	46	52,3	50	M30	180	60	16	0,901	14,416	32	0,277	8,864	32	0,073	2,336	363	310	0,097
350	570	510	52	66,3	64,1		160	60		0,956	15,296							421	350	0,131
400	685	865	58	105,4	102	M36	220	70		1,610	25,760		0,441	14,112		0,129	4,128	473	385	0,16

Key: (1). tube in mm. (2). flanges A and B according to GOST. (3). the outside diameter D in mm. (4). the diameter of the bolt circumference D_1 in mm. (5). thickness b in mm. (6). the weight of one flange in kg. (7). with projection (flange A). (8). with indentation (flange B). (9). Fasteners for one connection. (10). pin according to GOST. (11). thread. (12). length in mm. (13). weight in kg. (14). pin. (15). thread. (16). a quantity in pcs. (17). one pin. (18). total. (19). Nuts according to GOST. (20). one nut. (21). washer according to GOST. (22). one washer. (23). Packing are Paronit. (24). outside diameter. (25). bore. (26). the weight of one packing in kg. (27). in mm.

Page 56.

4.4. Plug/silencers.

For the conduit/manifolds of heat grid/networks, are applied three types of plug/silencers according to GOST 6973-59;

type I - into conditional pressure P_y=2,5; 6; 10; 16 and 25 kg/cm² with smooth sealing surface;

types II and III - to conditional pressure P_y=40 and 64 kg/cm², plug/silencer of type II have sealing surface with projection, but type III is with indentation.

The characteristic of plug/silencers is given in Table 4.15.

Fastening materials and packing for flange joints with plug/silencers are accepted in accordance with Tables 4.10-4.13. The mark/brands of steel for plug/silencers depending on conditional pressures and passes are given in Table 4.19.

4.5. Gasket compensators.

In thermal grid/networks apply steel gasket compensators into conditional pressure P_y to 16 kg/cm², one-way (Fig.

4.6) and bilateral (Fig. 4.7).

Basic dimensions, weight and the greatest compensation capacity of these compensators are given in Table 4.16 and 4.17.

The calculated compensation capacity of gasket compensators is accepted than lower indicated (see Tables 4.16-4.17) upon value z, which considers the insufficient accuracy/precision of the manufacture of compensators and the possible compliance/pliability of fixed supports.

During the determination of the dimensions of the camera/chambers, is considered the adjusting length of gasket compensators $L_{уст}$, determined by the formula

$$L_{уст} = A - z \text{ мм}, \qquad (4.1)$$

where A is length of compensator in mm (see Tables 4.16 and 4.17);

z - the unusable compensation capacity in mm; they accept according to table 4.18.

The value of quantity $L_{уст}$ is taken according to Table 4.19.

Table 4.14. Table of mutual interchangeability of flanges to different conditional pressures according to GOST 1234-54 *.

(1) Условный проход D_y в мм	(2) Фланцы для P_y в кгс/см²					
	6	10	16	25	40	64
	(3) Заменяющие фланцы для P_y в кгс/см²					
15	2.5	—	10	16; 10	25; 16; 10	—
20						
25						
32						
40						
50						
70			10	—	25	
80			—	16	25,16	
100			10	—	25,16	
125			10	—	25	
150			10	—	25	
200			—	—	—	
250			—	—	—	
300			—	—	—	
350			—	—	—	
400			—	—	—	
500			—	—	—	
600			—	16	—	
800			—	—	—	
1000			—	—	—	
1200			—	—	—	

Key: (1). The internal diameter D_y in mm. (2). Flanges for P_y in kg/cm². (3). Replacing flanges for P_y in kg/cm².

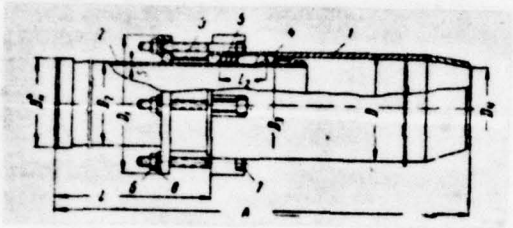


Fig. 4.6. Compensator gasket one-way.

1 - housing; 2 - branch connection with ring; 3 - main bush; 4 - bottom box; 5 - packing; 6 - nut; 7 - bolt; 8 - washer.

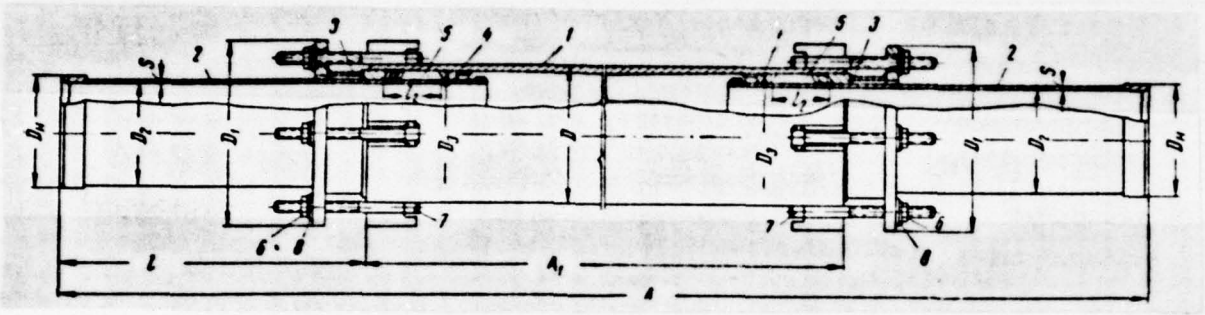


Fig. 4.7. Compensator gasket bilateral.

1 - housing; 2 - branch connection with ring; 3 - main bush; 4 - bottom box; 5 - packing; 6 - nut; 7 - bolt; 8 - washer.

Page 57.

Table 4.15. Plug/silencers flanged flat/plane steel on P_y to 64 kg/cm² (according to GOST 6973-59).



(2) D_y	P_y = 10 kg/cm² (3)				P_y = 16 kg/cm² (3)				P_y = 25 kg/cm² (3)				P_y = 40 kg/cm² (3)					P_y = 64 kg/cm² (3)				
	(4)	(5)	(6)	(7)	(4)	(5)	(6)	(7)	(4)	(5)	(6)	(7)	(4)	(5)	(6)	(7) вес в кг		(4)	(5)	(6)	(7) вес в кг	
																тип II	тип III				тип II	тип III
15	95	65	12	0,53	95	65	12	0,53	95	65	12	0,53	95	65	16	0,57	0,7	105	75	14	0,77	0,91
20	105	75		0,67	105	75		0,67	105	75		0,67	105	75		0,74	0,87	125	90	16	1,14	1,4
25	115	85	12	0,8	115	85	12	0,8	115	85	12	0,8	115	85	16	0,9	1,05	135	100	22	1,82	2,08
32	135	100		1,12	135	100		1,12	135	100		1,12	135	100		1,22	1,45	150	110		2,15	2,49
40	145	110	14	1,5	145	110	14	1,5	145	110	14	1,5	145	110	18	1,57	1,84	165	125	24	2,98	3,38
50	160	125		1,85	160	125		1,85	160	125		1,85	160	125		2,03	2,3	175	135	26	3,74	4,12
70	180	145		2,4	180	145		2,4	180	145	16	2,68	180	145	20	2,75	3,2	200	160	28	5,33	5,83
80	195	160		2,8	195	160		2,8	195	160	18	3,04	195	160	22	3,83	4,35	210	170	30	6,38	6,75
100	215	180		3,4	215	180		3,4	230	190	20	5,0	230	190	24	6,61	6,39	250	200	32	10,1	10,4
125	245	210	16	5,3	245	210	16	5,3	270	220	22	8,6	270	220	28	10	10,6	295	240	36	15,7	16,3
150	280	240		6,8	280	240	18	7,85	300	250	24	11,9	300	250	32	13,8	14,4	340	290	40	23,4	24,5
175	310	270		8,47	310	270		9,6	360	290	26	15,5	350	295	34	21,1	22	360	310	46	32,6	33,3
200	345	295		10	335	295	20	12,8	360	310		18,7	375	320	34	27,9	28,8	415	345	50	42,9	43,4
250	390	350	18	15,7	405	355	24	22	425	360	30	31,4	415	365	44	46,4	47,8	470	400	56	62,7	63,3
300	440	400	20	22	460	410	28	34	485	430	34	44,7	510	450	48	66,3	68	530	460	62	91,7	93,8
350	500	460	24	34	520	470	32	49,8	550	490	38	64,6	570	510	50	85,1	90,3	585	525	64	121,9	123,6
400	565	515	26	47,7	580	525	34	65,5	610	550	40	84,8	655	585	56	110	114	670	585	68	154,6	157,2
450	615	565	28	61,5	640	585	38	80,6	660	600	42	101,3	–	–	–	–	–	–	–	–	–	–
500	670	620	30	78,5	705	650	40	114,5	730	660	44	141,9	–	–	–	–	–	–	–	–	–	–
600	780	725	34	120	840	770	46	186	840	770	50	202,6	–	–	–	–	–	–	–	–	–	–
700	895	840	40	189,2	910	840	50	234	955	875	62	321,8	–	–	–	–	–	–	–	–	–	–
800	1010	950	42	272	1025	950	52	318	1070	990	64	428,1	–	–	–	–	–	–	–	–	–	–
900	1110	1050	46	385	1120	1060	56	440	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1000	1220	1160	50	442	1255	1170	60	567	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Key: (1). Type. (2). tube in mm. (3). kg/cm². (4). the outside diameter D in mm. (5). the diameter of the bolt circumference C, in mm. (6). thickness b in mm. (7). weight in kg.

Page 58.

Table 4.16. Compensators are gasket on MN 2593-61.

(1) Условный проход сальникового компенсатора D_y в мм (шифр МП)	(2) Размеры в мм								(3) Площадь патрубка по наружному диаметру $F_{сн}$ в см²	(4) Набивка-шнур марки АПР или АН ГОСТ 5152—55				(9) Болты		(12) Общий вес в кг	(13) Напорная компенсирующая способность в кг
	$D_н$	A	l	D_1	D	D_2	D_3	S		(5) диаметр или сторона квадрата в мм	(6) количество колец в шт.	(7) l_2 в мм	(8) площадь поперечного сечения $f_н$ в см²	(10) диаметр	(11) количество n в шт.		
100	108	820	375	190	133	124	104	3	85	10	8—10	65	35,8	M16	3	20,5	250
125	133	835		215	159	150	128		129				48,2			25,4	
150	159	990	435	250	194	182	154	3,5	185	13		85	73,9		4	43,8	300
175	194	955		280	219	208	188		278	10	10—12		62,2			49,9	
200	219	1160	490	345	273	250	212	4	353	25	8—10	130	177,9	M20		92	
250	273	1150		395	325	310	265	4,5	552	22			203,2		6	125,9	
300	325	1170		450	377	358	318	5	794	19			212,4			158	
350	377	1175		500	425	405	370	6	1075				213			167	
400	426	1360	590	560	478	455	418	7	1372				260		8	212	400
450	478	1360		610	529	505	470	8	1735				268			243	
500	529	1370		675	578	570	520		2124	25		140	428	M24	10	333	
600	630	1375		780	680	672	622	9	3039				508		10	400	
700	720	1380		875	774	762	712	10	3982				578		12	479	
800	820	1385		980	874	862	812	11	5178				658	M27		600	
900	920	1385		1085	974	962	912	12	6533				735		14	687	
1000	1020	1380		1185	1078	1062	1012		8044				808			790	

The note: 1. Is allow/assumed the manufacture of the housing of compensators $D_y = 350 \div 1000$ mm of one shell.

2. Size/dimensions A and ℓ are given with completely advanced branch connection of compensator.

3. All parts of compensators, except bolts, are manufactured from steel of brand St. 3 according to GOST 380-60; bolts are manufactured from steel St. 5 according to GOST 380-60.

4. Two or three of front/leading or averages of ring of gasket packing from main bush are fulfilled from thermoresistant rubber of the same cross section, as asbestos rings. In water thermal grid/networks is applied heat-resistant rubber according to GOST 7338-55.

Key: (1). The internal diameter of gasket compensator D_y in mm (code MM). (2). Size/dimensions in mm. (3). Area of connection according to outside diameter F_{CH} in cm². (4). packing-cord of the mark/brand APR or AN GOST 5152-55. (5). diameter or the sides of square in mm. (6). a quantity of rings in pcs. (7). in mm. (8). cross-sectional area f_H in

cm². (9). Bolts. (10). diameter. (11). quantity n in pcs. (12). Total weight in kg. (13). Greatest compensation capacity in mm.

Page 59.

During the incomplete use of a compensation capacity value $L_{уст}$ accepts that which was decreased and determine from the formula

$$L_{уст} = A - z - (a_{расч} - \Delta l)\ мм, \qquad (4.2)$$

where $a_{расч}$ is the calculated compensation capacity of compensator in mm (see Table 4.19);

Δl - the complete thermal elongation of the designed section of conduit/manifold in mm.

Complete thermal elongation is determined from the formula

$$\Delta l = \alpha L (t - t_{м.о})\ мм, \qquad (4.3)$$

where α is a coefficient of the linear expansion of tube steel in mm/m°C;

L - the distance between fixed supports in m;

t - calculated temperature of heat carrier in °C;

$t_{н.о}$ – the calculated temperature of surrounding air for the planning of heating in °C.

The assembling length of gasket compensator $L_{монт}$ considers the temperature of surrounding air during the installation of conduit/manifolds and it is determined from the formula

$$L_{монт} = L_{уст} - 0{,}012\,(t_м - t_{н.о})\,L, \qquad (4.4)$$

where $t_м$ is the temperature of surrounding air at which is conducted the installation of conduit/manifcld in °C.

Table 4.17. Compensators gasket bilateral on MN 2598-61.

(1) Условный проход сальникового компенсатора D_y в мм (шифр по МН)	(2) Размеры в мм		(3) Общий вес (при A_1) в кг	(4) Наибольшая компенсирующая способность в мм
	A	A_1		
100	1620	870	41,62	2×250
125			49,93	
150	1900	1030	86,43	
175			100	
200	2160	1180	177	2×300
250			243	
300			305	
350			318	
400	2560	1380	406	
450			468	
500	2620	1440	651	2×400
600			784	
700			939	
800			1169	
900			1339	
1000			1528	

Notes: 1. Remaining size/dimensions are accepted according to table 4.16; in this case a quantity of rings of packing and a quantity of bolts are doubled.

2. If according to designs is necessary branch conduit from housing of compensator, is allow/assumed increase in length of housing A_1 by value, equal to outside diameter of branch/shunted conduit/manifold.

3. Size/dimension A is given with completely pushed forward branch connection of compensator.

4. Material - see notes 3 and 4 to Table 4.16.

Key: (1). The internal diameter of gasket compensator D_y in mm (code on MN). (2). Size/dimensions in mm. (3). Total weight (with A_1) in kg. (4). Greatest compensation capacity in mm.

Table 4.18. Value of quantity z.

(1) Условный проход сальникового компенсатора D_y в мм	(2) Значение z в мм	
	(3) односторонний сальниковый компенсатор	(4) двухсторонний сальниковый компенсатор
100, 125	20	40
150—350	30	60
400—1000	40	80

Key: (1). The internal diameter of gasket compensator D_y in mm. (2). Value z in mm. (3). one-way gasket compensator. (4). bilateral gasket compensator.

Table 4.19. Adjusting length and the calculated compensation capacity of gasket compensators.

(1) Условный проход сальникового компенсатора D_y в мм	(2) Установочная длина сальникового компенсатора $L_{уст}$ в мм		(3) Расчетная компенсирующая способность сальникового компенсатора $a_{расч}$ в мм	
	(4) одностороннего	(5) двухстороннего	(4) одностороннего	(5) двухстороннего
100	800	1580	230	460
125	815			
150	960	1840	270	540
175	935			
200	1130	2100		
250	1120			
300	1140			
350	1145			
400	1320	2480	360	720
450	1320			
500	1330	2540		
600	1335			
700	1340			
800	1345			
900	1345			
1000	1350			

Note. Table gives the adjusting length of gasket compensators during the complete utilization of the calculated compensation capacity.

Key: (1). The internal diameter of gasket compensator D_y in mm. (2). Adjusting length of gasket compensator L_{yct} in mm. (3). Calculated compensation capacity of gasket compensator ($a_{расч}$) in mm. (4). one-way. (5). bilateral.

Page 60.

4.6. Corrugated compensators.

By the institute Giproneftemash [State Scientific Research and Planning Institute of Petroleum Machinery Manufacture] are developed the corrugated compensators: general-purpose of the hinged type (Fig. 4.8) and axial. Compensators are made for tubes by internal diameter $D_y = 150 \div 400$ mm to pressure $P_y = 16$ and by 25 kg/cm² at the temperature of heat carrier to 450°C.

Hinged type compensators are incorporated in into the conduit/manifolds of different configuration and provide the compensation for considerable thermal elongations, working on bending in one plane around the axle/axes of its hinge joints. Example of the arrangement/position of hinged compensators on section Z of the figurative configuration is shown in Fig. 4.9. Table 4.20 gives the greatest one-way angles of curvature of hinged type general-purpose compensators, while in table 4.21 the compensation capacity of z-shaped circuit depending on the distance between centers of hinge joints and numbers of waves of compensator.

The axial compensators, compression and elongation, are establish/installed in straight sections of conduit/manifolds. The value of the compensation capacity of one wave depending on the diameter of conduit/manifold and parameters of heat carrier for axial compensators is given in table 4.22.

For the manufacture of corrugated compensators, are applied the material of the flexible cell/element Kh18N9T, the material of welded branch connections - steel 20.

Number of waves of one compensator from 2 to 10.

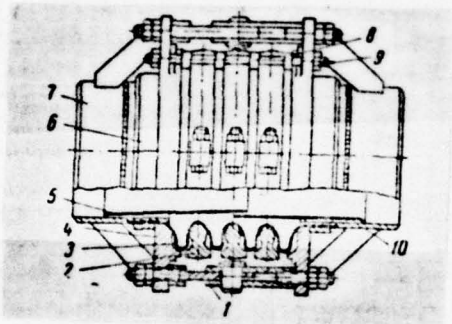


Fig. 4.8. Compensator corrugated general-purpose of hinged type. 1 - hinge joint; 2 - semiring limiting; 3 - flexible cell/element; 4 - ring supporting/reference; 5 - shell conical; 6 - ring band; 7 - branch connection; 8 - adapter; 9 - pin; 10 - shell is cylindrical.

Table 4.20. Greatest one-way angles of curvature of general-purpose compensators with $P_y = 25$ kg/cm^2.

(1) Условный проход компенсатора D_y в мм	(2) Наибольшие односторонние углы изгиба α_1 при числе волн		
	1	3	6
150	2°20′	7°	14°
200	2°08′	6°24′	12°48′
250	2°03′	6°09′	12°18′
300	2°	6°	12°
350	1°55′	5°45′	11°15′
400	1°50′	5°30′	11°

Key: (1). The internal diameter of compensator D_y in mm. (2). Greatest one-way angles of curvature α_1 with the number of waves.

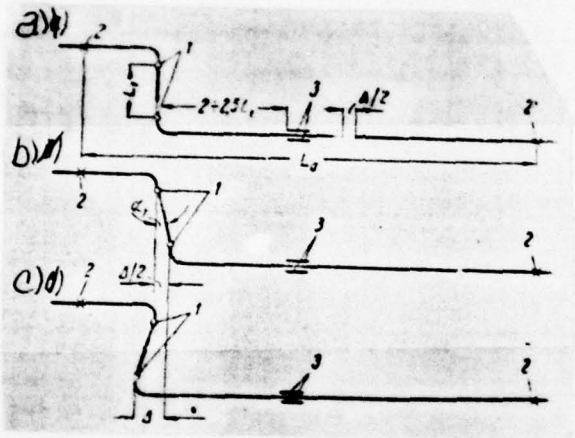


Fig. 4.9. Z-shaped circuit of application/use of hinged type two general-purpose compensators: a) in state of installation; b) preliminary bracing; c) in running order; 1 - general-purpose compensator of hinged type; 2 - fixed support; 3 - directing support; L_1 - distance between centers of hinge joints; L_0 - distance between fixed supports; α_1 - one-way angle of curvature of compensator; Δ - complete compensation capacity of compensator; $\Delta/2$ - half

of complete compensation capacity of compensator and value of preliminary bracing.

Table 4.21. The compensation capacity of the z-shaped circuit

(1) Количество компенсаторов в узле	(2) Количество волн одного компенсатора	(3) Расстояние между осями шарниров L_1 в мм	(4) Полная компенсирующая способность Δ в мм
2	3	2	400
		4	800
		6	1200
	6	2	850
		4	1700
		6	2500

Key: (1). Quantity of compensators in assembly. (2). Quantity of waves of one compensator. (3). Distance between centers of hinge joints L_1 in mm. (4). Complete compensation capacity Δ in mm.

Table 4.22. The compensation capacity of one wave of axial compensators in mm.

(1) Условный проход компенсатора D_y в мм	(2) Давление условное P_y в кгс/см²	
	16	25
150	10	10
200	14	12
250	16	14
300	18	16
350	20	18
400	20	18

Key: (1). The internal diameter of compensator D_y in mm.
(2). Pressure conditional P_y in kg/cm².

End Section.

Page 61.

Chapter 5.

DRAINAGE DEVICES OF CONDUIT/MANIFOLDS.

5.1. Drainage of water thermal grid/networks.

For the drainage of the conduit/manifolds of water thermal grid/networks and condensate pipings, provide for setting up at the lowest points of the conduit/manifolds of devices for the descent of water (drains), but at peaks - let-offs of air (air-escape cocks) (Fig. 5.1 and 5.2).

On branches from the basic conduit/manifolds of drain and the air-escape cocks before the catch branch do not establish/install; after catches with the diameter of tubes

300 mm and above are establish/installed either the air-escape cocks or drains depending on the direction of gradient/draft on branch. Drainage of branches with the smaller diameters of tubes is produced because of unbolting of the flange joint of catch.

If on section are vertical climbs of conduit/manifolds (transfer/transitions through the railroad and the like), at the lower point before the lift is establish/installed a drain, and at higher transition point - air-escape cock.

With the local bendings of conduit/manifolds in vertical plane with height/altitude to 1 m the setting up of air-escape cocks is optional. For drains and air-escape cocks, is provided for the fitting into the conduit/manifold of branch with end/face under coupling or flanged reinforcement (valve/gate or catch).

In each drain or air-escape cock, are establish/installed the valve/gate or the catch. Conditional passes of branch and close fitting valve accept identical.

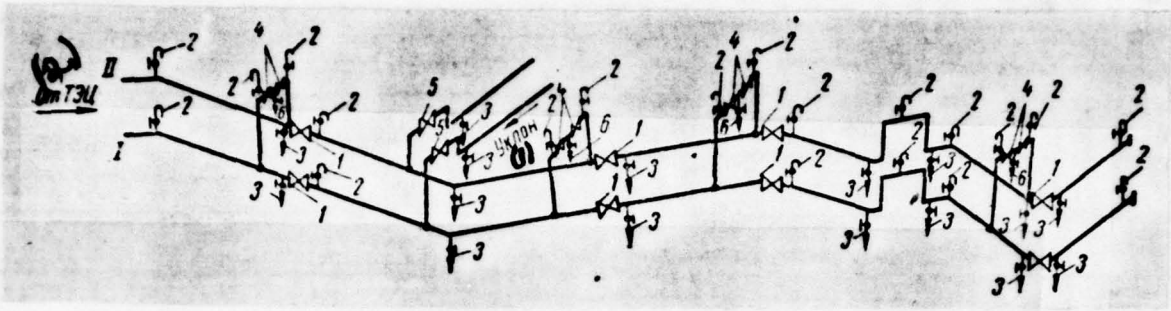


Fig. 5.1. Exemplary/approximate circuit of arrangement of drains and air-escape cocks on conduit/manifolds of water thermal grid/networks.

Key: (1). Gradient/draft. (2). From.

I - feeding conduct; II - return conduct: 1 - sectionalized catches; 2 - air-escape cocks; 3 - drains; 4 - cut-off fitting on crosspiece; 5 - cut-off fitting on branch pipe; 6 - check drains on crosspiece.



Fig. 5.2. Exemplary/approximate circuit of arrangement of drains and air-escape cocks during condensate pipings.

1 - sectionalizing catches; 2 - air-escape cocks; 3 - drains.

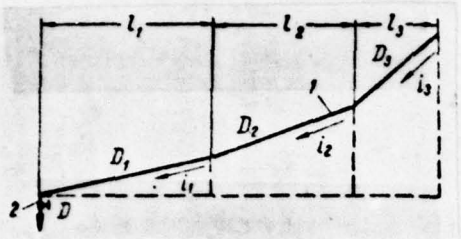


Fig. 5.3. Circuit of one-way draining. 1 - drain/vented conduit/manifold; 2 - l_1, l_2, l_3 - length of the drain/vented sections of conduit/manifold by diameters D_1, D_2 and D_3 and by gradient/drafts i_1, i_2 and i_3; D - diameter of drain.

Page 62.

The diameters of drains are determined of the condition of the descent of water of the drain/vented section not more than after 5 h.

At the speed of water in drainage line on the order of 1 m/s the diameter of drain with one-way draining (Fig. 5.3) is determined from the formula

$$D = D_{np} a \sqrt[4]{\frac{\Sigma l}{i_{np}}} \, n \, м, \qquad (5.1)$$

where D_{np} is the given diameter of the drain/vented conduit/manifold in m; Σl is the overall length of the drain/vented conduit/manifold in m; i_{np} is the given gradient/draft of the drain/vented conduit/manifold; a - the coefficient, depending on the coefficient of the consumption of the close fitting valve: for valve/gate a = 0.0144, for catch a = 0.011; n - the coefficient, depending on the time of the draining of the section t

with $t=5$ " $n=0.45$
" $t=4$ " $n=0.5$
" $t=3$ " $n=0.58$
" $t=2$ " $n=0.72$
" $t=1$ " $n=1$

The given diameter of the drain/vented conduit/manifold is determined from the formula

$$D_{np} = \frac{D_1 l_1 + D_2 l_2 + \cdots + D_n l_n}{\Sigma l} \text{ m}. \qquad (5.2)$$

The given gradient/draft of the drain/vented conduit/manifold is determined from the formula

$$i_{np} = \frac{i_1 l_1 + i_2 l_2 + \cdots + i_n l_n}{\Sigma l}. \qquad (5.3)$$

In formulas (5.2) and (5.3): l_1, l_2, ..., l_n - the length of the drain/vented sections of conduit/manifolds in m by diameters D_1, D_2, ..., D_n in m with gradient/drafts i_1, i_2, ..., i_n.

With bilateral draining (Fig. 5.4) the diameter of

drain is determined from the formula

$$D_{экв} = \sqrt{D_I^2 + D_{II}^2}\ м, \qquad (5.4)$$

where D_I, D_{II} are the diameters of drains of the first and second sections of conduit/manifold, defined separately for each section as with one-way draining by formula (5.1), in m.

For the facilitation of calculations according to formula (5.1) by Mosenergoproyekt [Planning Office of the Moscow Regional Administration of Power System Management] is constructed the nomogram with n = 1 (Fig. 5.5).

The diameters of air-escape cocks must be 2-3 times of the less diameter of drain, but it is not less than 15 mm.

It is allow/assumed to accept the diameters of drains and air-escape cocks without special calculations depending on the diameter of the drain/vented conduit/manifold (Table 5.1 and 5.2).

It is necessary drainage reinforcement to furnish

possibly nearer to the drain/vented conduit/manifold for the device of common/general/total heat insulation. The minimum height/altitude of branch for the connection of flanged reinforcement is given in Table 5.3, while the minimum height/altitude of branch from water and gas lines for the connection of coupling reinforcement - in Table 5.4.

With above-grade packing for even more approaching of drainage device the basic conduit/manifold, is applied the construction of drain device, given in Fig. 5.8.

During the arrangement/position of drains in camera/chambers or assemblies of through tunnels, drainage conduit/manifolds feed to pit in the bottom of the camera/chamber or tunnel separately for each tube and do not unite into collector/receptacles or into common/general/total discharge pipes.

Table 5.1. Diameters of branches and close fitting valve for drains.

(1) Условный проход трубопровода D_y в мм	До (2) 70 вкл.	80—125	150—175	200—250	300—400	450—500	600—700	800—900	1000—1200
(3) Условный проход штуцера и запорной арматуры D_{y1} в мм	25	40	50	80	100	150	200	250	300

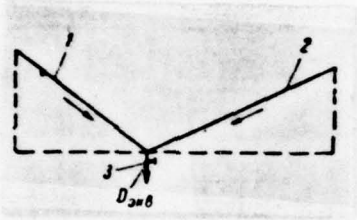
Key: (1). The internal diameter of conduit/manifold D_y in mm. (2). To 70 on. (3). The internal diameter of branch and close fitting valve D_{y1} in mm.

Table 5.2. Diameters of air-escape cocks.

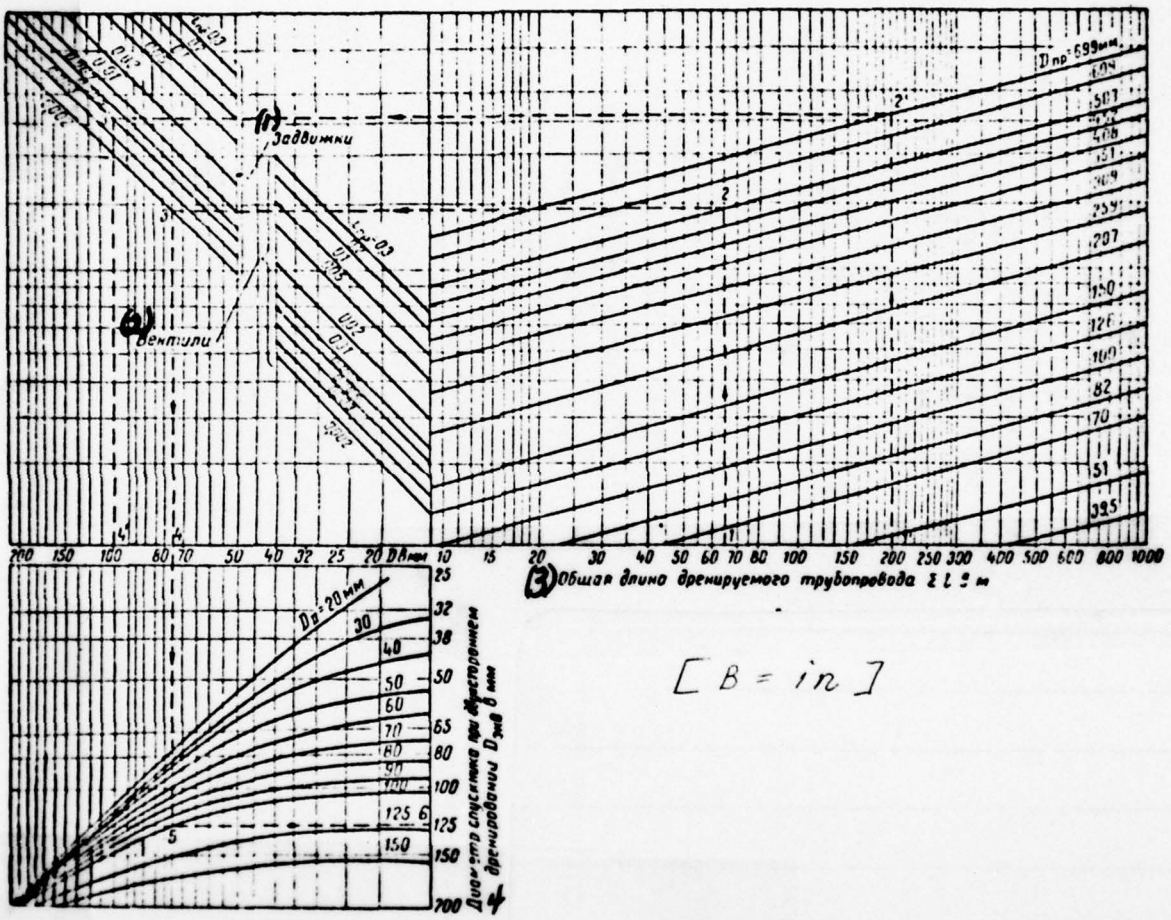
Условный (1) проход трубопровода D_y в мм	25—80	100—150	175—300	350—450	500—700	800—1200
Условный (2) проход воздушника D_{y1} в мм	15	20	25	32	40	50

Key: (1). The internal diameter of conduit/manifold D_y in mm. (2). The internal diameter of air-escape cock D_{y1} in mm.

Fig. 5.4. Circuit two of outside draining. 1 - first section of the drain/vented conduit/manifold; 2 - second section of the drain/vented conduit/manifold; 3 - drain; $D_{экв}$ - equivalent diameter of drain with bilateral draining.



Page 63.



[B = in]

Fig. 5.5. Nonogram for determining the diameters of reinforcement for the descent of water from conduit/manifold. $D_{пр}$ is the given diameter of the drain/vented conduit/manifold

in mm; $i_{пр}$ is the given gradient/draft of the drain/vented conduit/manifold; D - the diameter of drain with one-way draining in mm.

Example. To determine the diameter of drain with bilateral draining. It is given: for section I - $D_{пр}=507$ мм; $\Sigma l=65$ м; $i_{пр}=0{,}002$; for section II - $D_{пр}=699$ мм; $\Sigma l=200$ м; $i_{пр}=0{,}005$.

Connecting in series points 1-2-3 and 1°-2°-3°, we find the diameter of drain with one-way draining in point 4 for section I, $D_{I}=75$ mm, and in point 4°- for section II, $D_{II}=100$ mm. Connecting points 4-5 in point 6 we find the equivalent diameter of drain with bilateral draining, $D_{экв}=125$ мм

Key: (1). Catches. (2). Valve/gates. (3). The overall length of the drain/vented conduit/manifold. (4). Diameter of drain with bilateral draining.

Page 64.

With the evacuation of the lowered from conduit/manifolds water by movable pumps expedient to evacuate water directly from conduit/manifolds, for which

with the open end end/faces of drainage tubas are establish/installed the coupling heads (table 5.5) for the connection to them of flexible hoses. Coupling heads can be applied type II - grip-type with the male thread for screwing up into coupling valve/gate or for connection with tube with the aid of clutch and type III - coupling with the female thread for turning on of head to drain pipe.

If drainage conduit/manifold has a diameter of more than 80 mm, coupling head is establish/installed on the special branch before the catch.

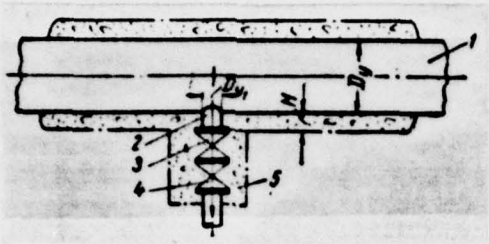


Fig. 5.6. Construction of drains during water thermal grid/networks and condensate pipings and of starting/launching drainages on steam lines (version 1). 1 - drain/vented conduit/manifold by the internal diameter D_y 2 - branch; 3 - catch or valve/gate; 4 - the same, only for the starting/launching drainage of steam lines with $P_{раб}$ kgf/cm; 5 - isolation/insulation.

Table 5.3. Minimum height/altitude of branch for the connection of flanged reinforcement on drainage devices with $P_y \leq 25$ kg/cm² (Fig. 5.6).

(1) Условный проход дренажного устройства D_{y1} в мм	15	20	25	32	40	50	80	100	150	200	250	300
(2) Минимальная высота штуцера H в мм	80	80	90	100	110	110	115	130	140	150	160	170

Key: (1). The internal diameter of drainage device D_{y1} in mm. (2). Minimum height/altitude of branch H in mm.

Table 5.4. Minimum height of branch and the length of thread for connection of coupling reinforcement of drainage devices with $P_y \leq 16$ kg/cm² and $t \leq 225°C$ (Fig. 5.7).

(1) Условный проход дренажного устройства D_{y1} в мм	15	20	25	32	40	50	80
(2) Минимальная высота штуцера H в мм	65	65	70	70	75	75	80
(3) Длина резьбы l по ГОСТ 6357—52 в мм	14	16	18	20	22	24	30

Key: (1). The internal diameter of drainage device D_{y1} in mm. (2). Minimum height/altitude of branch H in mm. (3). Length of thread l according to GOST 6357-52 in mm.

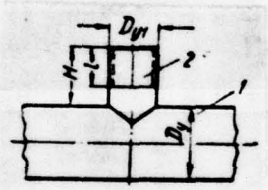


Fig. 5.7. Branch for connection of coupling reinforcement. 1 - drain/vented conduit/manifold by the internal diameter D_y; 2 - branch.

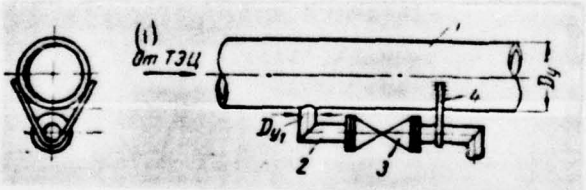


Fig. 5.8. Construction of drains on water thermal grid/networks and condensers and of starting/launching drainages on steam lines with $P_{раб} \leq 22$ kg/cm² (version 2). 1 - drain/vented conduit/manifold by the internal diameter D_y 2 - drainage conduit/manifold by the internal diameter D_{y1} 3 - catch with valve/gate; 4 - support - clasp made of strip steel.

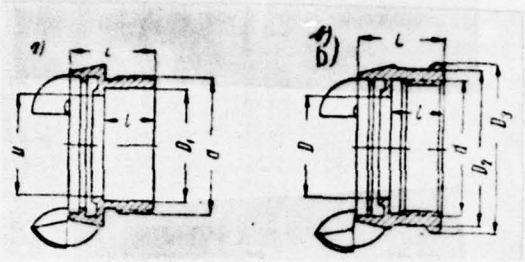


Fig. 5.9. Coupling head. a) type II -grip-type; b) type III - coupling.

Table 5.5. Coupling heads according to GOST 2217-54 (Fig. 5.9).

(1) Условный проход D_y в мм	(2) Размеры в мм						(3) Трубная резьба d в дюймах	(4) Вес в кг	
	D	D_1	D_2	D_3	L	l		(5) тип II	(6) тип III
25	25	25	38	42	29	16	1	0,167	0.166
40	31	38	54	58	33	20	1½	0.205	0 21
50	43	50	67	72	37	22	2	0.289	0.35
70	57	65	83	88	41	25	2½	0.469	0.522
80	69	76	96	102	45	28	3	0.622	0.722

Note. The housing of coupling heads is manufactured from the cast iron of brands kc30-6 or kc30-3 according to GOST 1215-59. Coupling heads supply completely together with rubber packing rings according to GOST 6557-53.

Key: (1). The internal diameter D_y in mm. (2). Size/dimensions in mm. (3). Pipe thread d in inches. (4). Weight in kg. (5). type.

Weight in kg. (5). type.

Page 65.

With above-grade packing at height/altitude more than 2 m for the maintenance of drains and air-escape cocks erect constant staircases and area/sites. Under the condition of the heating of drainage tubes because of their packing in common/general/total heat insulation with basic tube it is allow/assumed to abstract/remove drainage reinforcement to the assembly of conduit/manifolds or to lower to the earth/ground.

5.2. Drainage of steam lines.

For the drainage of steam lines, are provided for the starting/launching and constant drainages, and also the air-escape cocks, adjustable temporarily for start-up time (for hydraulic test).

Air-escape cocks are establish/installed in all peaks of

steam line; starting/launching drainages on steam lines are provided for in all lower points, before vertical climbs, on direct/straight sections with the incidental gradient/draft through 400-500 m, with contrary gradient/draft - through 200-300 m and before the reinforcement (Fig. 5.10). All the intercept/detached sections of steam line must have starting/launching drainages. At the points of starting/launching drainage on steam lines, is provided for the fitting of branches with close fitting valve. In each branch they establish/install: at a pressure pair to 22 kg/cm^2 catch or valve/gate, at a pressure pair above 22 kg/cm^2 two consecutive valve/gates - locking and regulating (drainage).

The diameter of branch and close fitting valve is accepted depending on the diameter of steam line according to Table 5.6.

Depending on the method of isolation/insulation of steam lines (by matte finishes or shells) it is possible to accept the construction of drainages, given in Fig. 5.6 or 5.8. The minimum height/altitude of branches for a starting/launching drainage can be accepted according to Table 5.7.

For the starting/launching drainage of steam lines $P_y \leq$ 25 kg/cm², can be applied also the nonfreezing drain valve, developed by the Irkutsk branch of Giproneftemash (Fig. 5.11). The construction of starting/launching drainage with this valve is given in Fig. 5.12.

Condensate, which is formed during the warming up of steam lines from the points of starting/launching drainage, is thrown out outside.

For an improvement in the conditions of maintenance during the warming up of the steam lines, laid in impassable channels or tunnels, drain pipes should be derive/concluded beyond the limits of the camera/chamber or tunned into channelization type series arranged/located special well.

For the branch/removal of condensate from the steam line of the saturated steam during its work, are provided for the constant drainages: in all lower points before vertical climbs, on direct/straight sections with the incidental gradient/draft through 400-500 m, with contrary - through 200-300 m.

Constant drainages in the steam lines of the superheated steam, as a rule, are not establish/installed; however, if steam line works with alternating/variable consumption pair (disconnection/cutoff of users, the gradualness of the introduction into action of users, etc.), of pairs during some conditions/modes can pass into saturation state. In such cases on steam lines, are provided for constant drainages just as on the steam line of the saturated steam.

Constant drainages usually are combined with starting/launching drainages. Then at the points of constant drainage in steam lines $D_y \geqslant 100$ mm establish/install the so-called pockets (Fig. 5.13 and 5.14).

The diameter of pocket is accepted depending on the diameter of steam line according to Table 5.8. Characteristic of branch with welded-in base is given in Table 5.9.

For steam lines by the internal diameter $D_y < 100$ mm pocket can be fulfilled through the type, given in Fig. 5.15.

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

3 OF 8
ADA
066413



5.95.

Constant drainage is realize/accomplished through drainage controllers. The diameter of conduit/manifolds and reinforcement for constant drainages can be accepted according to Table 5.10.

Table 5.6. Diameters of branches and close fitting valve for the starting/launching drainage of steam lines.

(1) Условный проход паропровода D_y в мм	До 70 (2) вкл.	80—125	150—175	200—250	300—400	450—600	700—800	900—1200
(3) Условный проход штуцера и запорной арматуры D_{y1} в мм	25	32	40	50	80	100	125	150

Key: (1). The internal diameter of steam line D_y in mm. (2). To 70 on. (3). The internal diameter of branch and close fitting valve D_{y1} in mm.

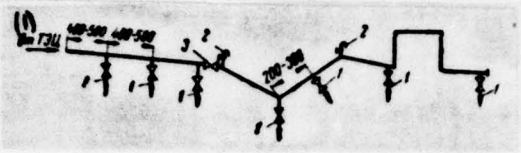


Fig. 5.10. Exemplary/approximate circuit of arrangement of starting/launching drainages and air-escape cocks on steam lines. 1 - starting/launching drainage; 2 - air-escape cock; 3 - sectionalizing catch.

Key: (1). From.

Table 5.7. The minimum height/altitude of branches H in mm for the starting/launching drainages of steam lines (see Fig. 5.6).

(1) Условный проход штуцера и запорной арматуры D_{y1} в мм	(2) Условное давление в паропроводе P_y в кгс/см²			
	<16	25	40	64
25	90	90	110	140
32	100	100	130	155
40	100	110	130	155
50	110	110	130	155
80	110	115	145	170
100	120	130	160	180
125	125	135	175	210
150	130	140	190	220

Key: (1). The internal diameter of branch and close fitting valve D_{y1} in mm. (2). Conditional pressure in steam line P_y in kg/cm².

Page 66.

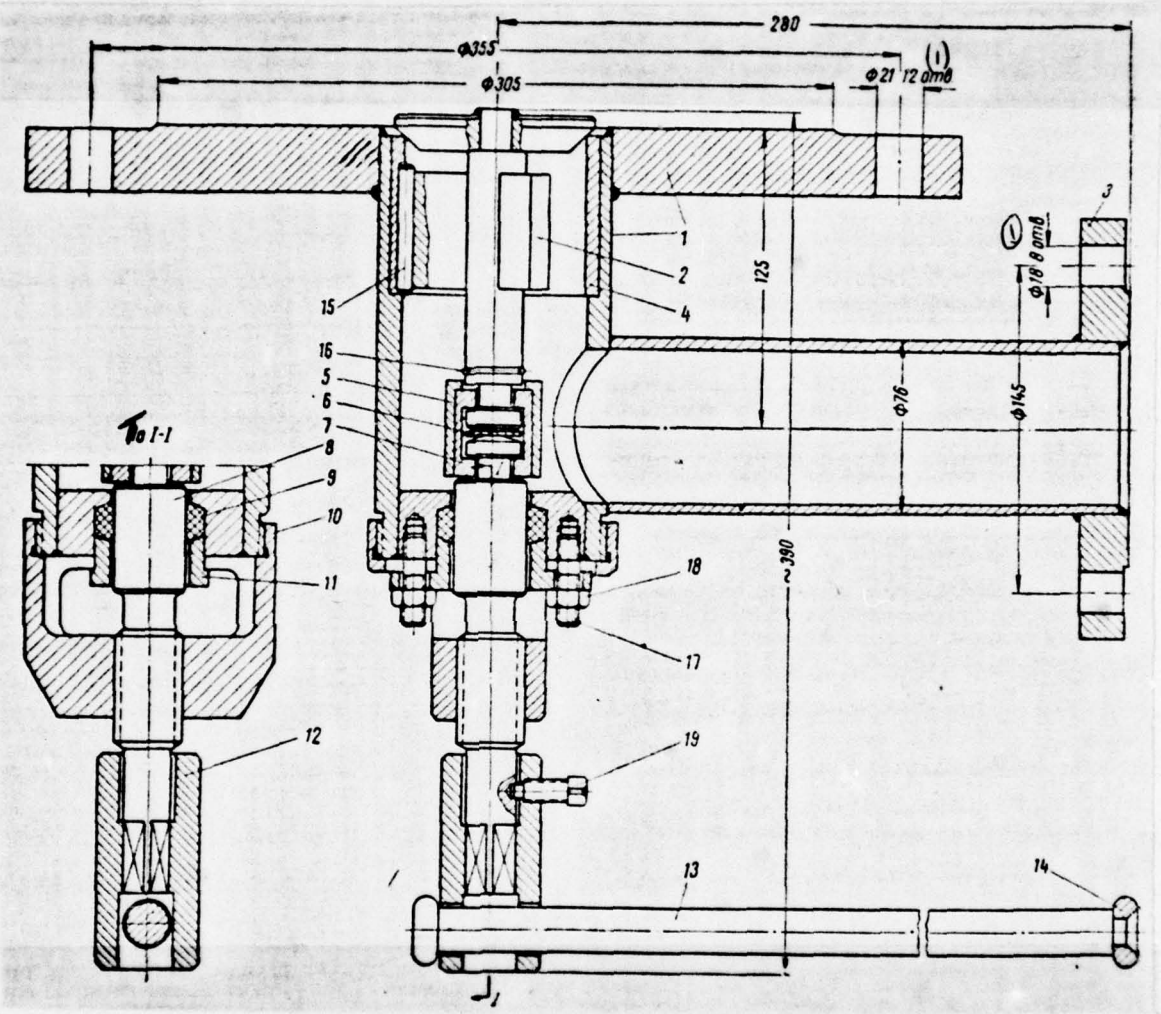


Fig. 5.11. Nonfreezing drain valve D_y=80 мм 1 - housing; 2 - valve; 3 - flange; 4 - saddle; 5 - bushing; 6 - washer; 7 - ring split; 8 - shaft; 9 - stuffing-box seal;

10 - cap/cover; 11 - flange of pressure; 12 - bushing; 13 - lever; 14 - washer; 15 - finger/pin; 16 - ring spring; 17 - pin; 18 - nut; 19 - screw/propeller.

Key: (1). holes.

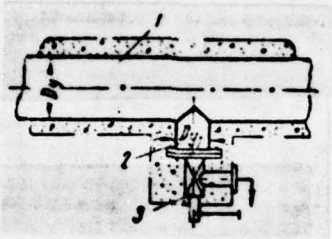
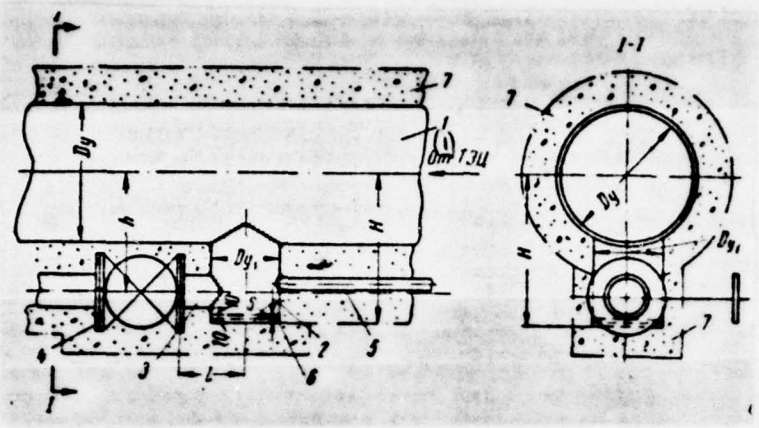


Fig. 5.12. Construction of starting/launching drainage with nonfreezing drain valve. 1 - steam line by the internal diameter D_y: 2 - branch by the internal diameter D_{y1}: 3 - drain valve.

Page 67.



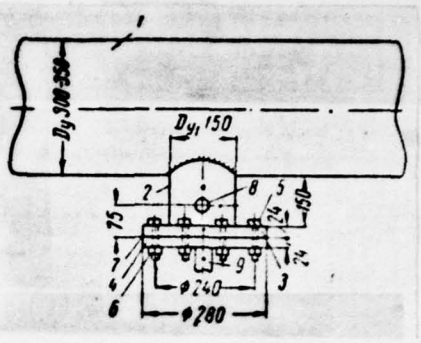


Fig. 5.14.

Fig. 5.13. Branch with welded-in base (pocket) for the constant and starting/launching drainage of steam line. 1 - steam line by the internal diameter D_{y1}: 2 - branch by the internal diameter D_{y1} with welded-in base; 3 - branch for a starting/launching drainage; 4 - valve/gate or catch; 5 - tube for constant drainage; 6 - base; 7 - isolation/insulation.

Key: (1). from.

Fig. 5.14. Branch with plug/silencer (pocket) for constant and starting/launching drainage of steam lines $D_y \geq 100$ mm. 1 - steam line by the internal diameter D_y - 300-350 mm; 2 - branch by the internal diameter $D_{y1} = 150$ mm; 3 - flange of welded; 4 - flange of transfer; 5 - bolt; 6 - nut; 7

- packing; 8 - tube for a constant drainage; 9 - tube for a starting/launching drainage.

Table 5.8. Diameters of pockets.

(1) Условный проход паропровода D_y в мм	100—125	150—175	200—250	300—350	400—450	500—600	700—800	900—12 0
(2) Условный проход кармана D_{y1} в мм	50	80	100	150	200	250	300	350

Key: (1). The internal diameter of steam line D_y in mm. (2). The internal diameter of pocket D_{y1} in mm.

Table 5.9. The thickness of base and the size/dimensions of the joining of branch (see Fig. 5.13).

(4) Условный проход трубы D_y в мм	(1) Штуцер: (5) условный проход D_{y1} в мм	(1) Штуцер: (6) внутренний диаметр в мм	(3) A в мм	(2) Толщина донышка s в мм			(3) A в мм			(3) H в мм		
				(7) условное давление P_y в кгс/см²								
				64	25	10	64	25	10	64	25	10
100	50	51	150	10	6	5	154	158	159	200	200	200
125							264	268	169	210	210	210
150	80	82	160	12	10	6	172	274	178	220		
200	100	100	180	15	10	8	226	231	223	290	280	280
250							246	251	253	310	310	310
300	150	150	220	22	15	10	293	300	300	380	380	375
350							323	330	325	410	410	400
400	200	207	250	30	20	13	355	355	352	450	440	430
450							—	—	383	—	—	470
500	250	259	280	—	—	16	—	—	410	—	—	500

Key: (1). Branch. (2). Thickness of base in mm. (3). in

мм. (4). The internal diameter of tube D_y in мм. (5). the internal diameter D_{y1} in мм. (6). bore in мм. (7). conditional pressure P_y in кг/см².

Page 68.

Condensate, forming in the work of steam line, is abstract/removed from the points of constant drainage into composite condensate piping or throw out outside. The branch/removal of condensate into condensers for the return of condensate from users can be realized on the condition that the pressure in steam line by the point of drainage exceeds pressure by condensate piping not less than on 1 кг/см². Special condensers for a collection incidental condensate, as a rule, do not lay.

With the parallel packing of several steam lines of different pressures, is allow/assumed the "cascade" circuit of the branch/removal of condensate with the bypass of condensate from steam line with higher pressure pair into the pocket of the branch/removal of the condensate of the steam line of lower pressure.

This circuit is possible with pressure difference pair not less than 3 kg/cm². In this case in the steam line pain low pressure, is applied the branch from welded-in it from the side tube for the intake of condensate from the pair of higher pressure.

5.3. Steam traps and drainage controllers.

The selection of drainage controllers is produced depending on the quantity of condensate, which is formed in steam line, and the pressure differential before and after drainage controller.

The pressure of condensate to drainage controller takes as equal to pressure pair at the point of drainage.

The pressure of condensate after drainage controller is accepted: when selecting of the type of drainage controller - equal to pressure pair after closed drainage controller (with the branch/removal of condensate into steam line with lower pressure in composite or forcing condensate piping - equal to pressure pair at the attachment point of drainage

condensate piping, with the jettisoning of condensate in the atmosphere or into the tank, which is imparted with atmosphere, of the equal to the atmospheric pressure), during the determination throughput capacity of drainage controller - equal to pressure pair after the open drainage controller taking into account losses of pressure in drain pipes.

The throughput capacity of drainage controllers on hot condensate can be determined by the nomogram (Fig. 5.16), corrected for the calculation of drainage controllers.

In the case where the quantity of condensate formed in the steam line is greater than the capacity of the selected drainage controllers, several drainage controllers are installed.

For the constant drainage of steam lines, are applied the drainage controllers 45ch9nzh and 45s10nzh (Fig. 5.17 and 5.18) and steam trap from D_y=25 mm BKZ 59-1-1 (Fig. 5.19).

The characteristics of the drainage controllers 45ch9nzh and 45s10nzh are given in Table 5.11 and 5.12. A selection of the type of drainage controllers is produced on the pressure differential before and after drainage controller with closed drainage controller on Table 5.11 and 5.12.

Table 5.10. Diameters of conduit/manifolds and reinforcement for constant drainages.

(1) Условный проход паропровода D_y в мм	50—100	125—350	400—600	700—1200
(2) Условный проход трубопроводов и арматуры D_{y1} в мм для постоянных дренажей	15	20	25	32

Key: (1). The internal diameter of steam line D_y in mm. (2). The internal diameter of conduit/manifolds and reinforcement D_{y1} in mm for constant drainages.

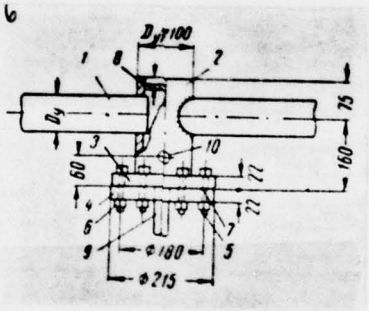


Fig. 5.15. Branch with plug/silencer (pocket) for constant and starting/launching drainage of steam lines D_y<100 mm. 1 - steam line by the internal diameter D_y; 2 - branch by the internal diameter D_{y1}; 3 - flange of welded; 4 - flange of transfer; 5 - bolt; 6 - nut; 7 - packing; 8 - base; 9 - tube for a starting/launching drainage; 10 - tube for a constant drainage.

Table 5.11. The characteristic of the drainage controller

Table 5.11. The characteristic of the drainage controller 45ch9nzh (see Fig. 5.17).

(1) Условный проход D_y в мм	(2) Условное обозначение конденсатоотводчика	(3) Перепад давлений ΔP в кгс/см²	(4) Номер седла	(5) Диаметр отверстия в седле d в мм	(6) Трубная резьба $d_{труб}$ в дюймах	(7) Основные размеры в мм				(8) Вес в кг
						D	L	H	h	
20	(9) (10) 45ч9нж1	(11) (12) От 0,5 до 1,5	1	9	¾	182	115	260	17	9,8
	45ч9нж2	» 1,5 » 4	2	6						
25	45ч9нж3	» 4 » 8	3	4	1	182	115	260	17	9,8
	45ч9нж4	» 8 » 13	4	3						
40	(9) (10) 45ч9нж5	(11) (12) От 0,5 до 1,5	5	14	1; 1¼	215	160	300	20	17,2
	45ч9нж6	» 1,5 » 4	6	10						
	45ч9нж7	» 4 » 8	7	7						
	45ч9нж8	» 8 » 13	8	5,2						
50	(9) (10) 45ч9нж9	(11) (12) От 0,5 до 1,5	9	20	2	230	170	315	25	22,6
	45ч9нж10	» 1,5 » 4	10	14						
	45ч9нж11	» 4 » 8	11	10						
	45ч9нж12	» 8 » 13	12	8						

The notes: 1 - drainage controller can be applied at conditional pressure pair $P_y \leq 16$ kg/cm² and temperature t $\leq$ 250°C.

2. With order one should indicate internal diameter and conventional designations of drainage controller in accordance with table; last figure in conventional designations designates number of interchangeable saddle, designed to specific throughput capacity of condensate.

Key: (1). Conditional pass Dy in mm. (2). The conventional designations of drainage controller. (3). The pressure differential Δ P in kg/cm². (4). Number of saddle. (5). Diameter of hole in saddle d in mm.

(6). The pipe thread d_{TP46} in inches. (7). Basic dimensions in mm. (8). Weight in kg. (9). h. (10). nzh. (11). From. (12). to.

Page 69.

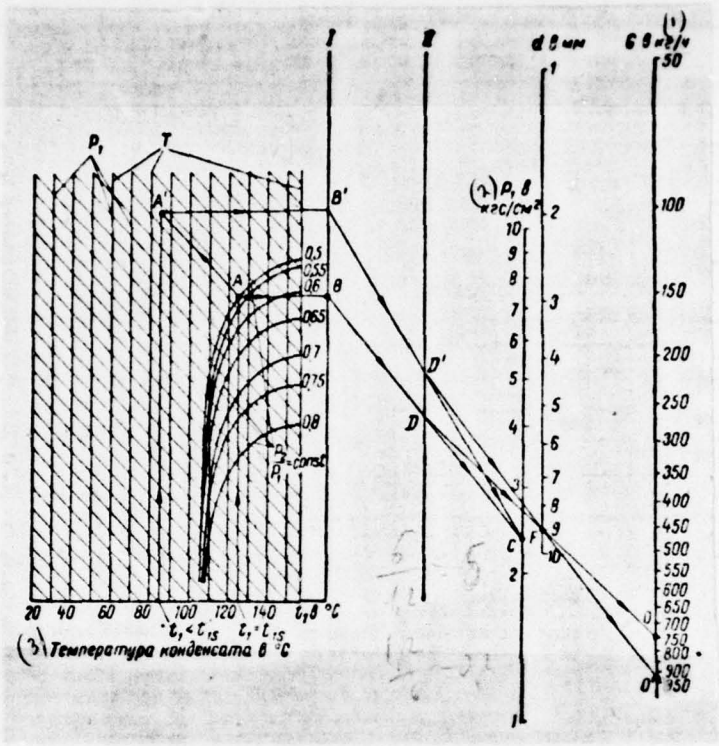


Fig. 5.16*. It is borrowed from Cand. of the tech. sciences V. S. Sokolovsky. Nomogram for determining the throughput capacity of drainage controllers from hot condensate. P_2/P_1 is a ratio of pressure pair after drainage controllers to pressure the pair before the drainage controller; t_1 is temperature of condensate in °C; t_{1s} is saturation temperature pair at pressure P_1 in °C; d - the diameter of hole in the saddle of drainage controller

in mm; G is the throughput capacity of drainage controller in kg/h. With $P_2/P_1 < 0.5$ should use the curve $P_2/P_1 = 0.5$.

Example of calculation when t_1-t_{15} Pressure is the pair before drainage controller $P_1 = 2.4$ kg/cm², pressure pair after drainage controller (taking into account losses in drain pipes) $P_2 = 1.25$ kg/cm²; temperature condensate $t_1-t_{15}=125°C$; the diameter of hole in drainage controller for the passage of condensate d = 98 mm.

Solution. From the point, which corresponds $t_1 = 125°C$, we carry out vertical straight line before intersection from the curve $P_2/P_1 = 1.2/2.4 = 0.5$ and we determine point A. From point A, we carry out horizontal line before intersection with dimensionless scale 1 and we determine point B.

After connecting point B with point C, which corresponds to value P_1, and point D, obtained on dimensionless scale II, with the point, which corresponds to value 9 mm on the scale of values d, let us determine at point 0 throughput capacity of drainage controller θ = 760 kg/h.

Example of calculation with $t_з$ = 85° < $t_н$ remaining data to accept for the preceding/previous example.

Solution. We define I turn/sharpen A as in the preceding/previous example. After conducting from point, appropriate $t_з$ = 85°C, vertical straight line before intersection with direct/straight, carried out from point A in parallel to straight line of pressures $P_з$, let us determine point A°. Then, after conducting construction on nomogram, similar to the preceding/previous example, let us determine at point 0° the throughput capacity of drainage controller G = 920 kg/h.

Key: (1). kg/h. (2). kg/cm². (3). Temperature of condensate in °C.

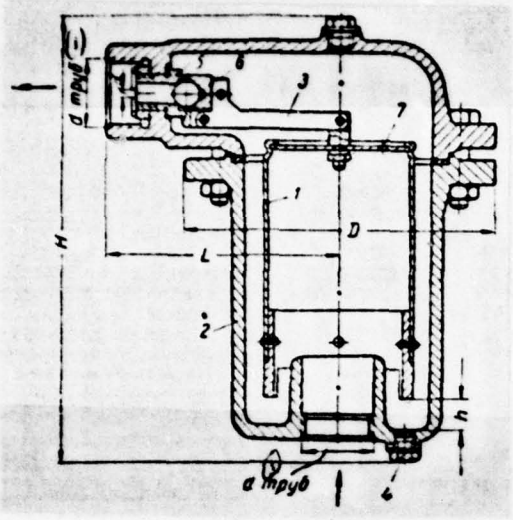


Fig. 5.17.

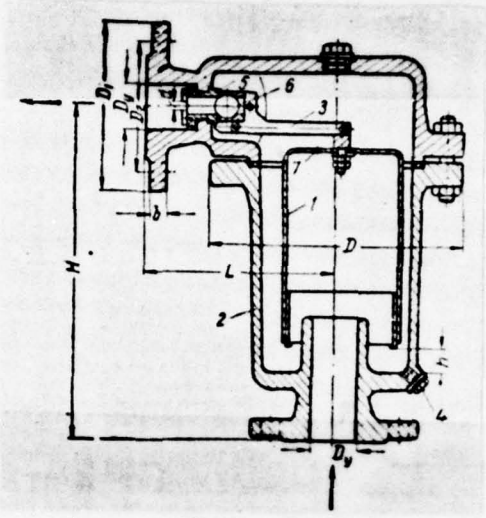


Fig. 5.18.

Fig. 5.17. Drainage controller with float coupling 45ch9nzh. 1 - float; 2 - housing; 3 - lever; 4 - drain cock; 5 - saddle; 6 - valve; 7 - hole.

Fig. 5.18. Drainage controller with float flanged 45ch10nzh. 1 - float. (2). housing; 3 - lever; 4 - drain cock; 5 - saddle; 6 - valve; 7 - hole.

Page 70.

The throughput capacity of the drainage controllers 45ch9nzh and 45s10nzh on cold condensate can be determined by Fig. 5.20.

by Fig. 5.20.

The drainage controller 45ch9nzh has coupling leads. As drain pipes are applied water and gas lines according to GOST 3262-62 with the thread, which corresponds to thread in drainage controller, indicated in table.

The drainage controller 45s10nzh has flanged leads according to GOST 1240-54, as the reciprocal flanges of conduit/manifolds, are applied the flanges according to GOST 1255-54* into conditional pressure 25 kg/cm².

Steam trap BK2 5S-1-1 is applied for conditional pressure $P_y \leq 64$ kg/cm² and to temperature pair t < 425°C. Construction provides for the setting up of steam trap in strictly vertical position and the necessary filling of vessel by water before its launching/starting into operation. Steam trap has flanged leads. Intake flange has four holes M18, and output, i.e., four holes M16. The reciprocal flanges of conduit/manifolds are applied type A from D_y=25 mm according to GOST 1260-54* in conditional pressure P_y=64 kg/cm².

The schematic of setting drainage controllers and

condensation it is pot for the drainage of steam lines it is given in Fig. 5.21.

During the setting up of condensation traps and drainage controllers make enclosure for repair, inspection, the descent of condensate during the warming up of steam lines and for the blasting of condensate pipings. Bypass line can not be provided for with the drainage of condensate into the steam line of lower pressure.

After drainage ccntrollers and steam traps, working with the jettisoning of condensate into overall condensate piping, during the supplying of condensate to height/altitude or in the steam line pain low pressure one should establish/install check valves, with the exception of those cases when check valves are provided for in the construction of drainage controller itself.

Steam traps and drainage controllers usually are establish/installed below the mark of the drainage of condensate from steam line, but it is not higher than the mark of drain pipe; in this case spot welding of the branch/removal of condensate of the steam line with drainage controller or steam trap are realize/accomplished by a

vertical or horizontal conduit/manifold with gradient/draft not less than 0.1 to the side of vessel.

Table 5.12. The characteristic of the drainage controller 45s10nzh (see Fig. 5.18).

(1) Условный проход D_y в мм	(2) Условное обозначение конденсатоотводчика	(3) Перепад давлений ΔP в кгс/см²	(4) Номер седла	(5) Диаметр отверстий в седле d в мм	(6) Основные размеры в мм							(7) Болтовые отверстия		(8) Вес в кг, не более
					D	L	H	h	D_1	D_2	b	(9) диаметр в мм	(10) количество в шт.	
20	45с10нж 1	от 0.5 до 1.5	1	9	182	130	290	12	105	75	16	14	4	13.3
	45с10нж 2	» 1.5 » 4	2	5										
	45с10нж 3	» 4 » 8	3	4										
25	45с10нж 4	» 8 » 13	4	3	182	130	295	12	115	85	16	14	4	15
	45с10нж 5	» 13 » 18	5	2.6										
40	45с10нж 1	от 0.5 до 1.5	1	14	222	165	360	22	145	110	18	18	4	26.5
	45с10нж 2	» 1.5 » 4	2	10										
	45с10нж 3	» 4 » 8	3	7										
	45с10нж 4	» 8 » 13	4	5.2										
	45с10нж 5	» 13 » 16	5	4.9										

Notes: 1. Drainage controller can be applied at conditional pressure pair $P_{y<25}$ kg/cm² and temperature t ≤ 45 °C.

2. With order one should indicate internal diameter and conventional designations of drainage controller in accordance with table; last figure in conventional designations indicates number of interchangeable saddle, which ensures a certain throughput capacity of condensate.

Key: (1). Conditions pass D_y in mm. (2). The conventional designations of drainage controller. (3). The pressure differential Δ P in kg/cm². (4). Number of saddle. (5). Diameter of holes in saddle d in mm. (6). Basic dimensions

in mm. (7). Bolt holes. (8). Weight in kg, is not more. (9). diameter in mm. (10). a quantity in pcs. (11). s. (12). mzh. (13). From. (14). to.

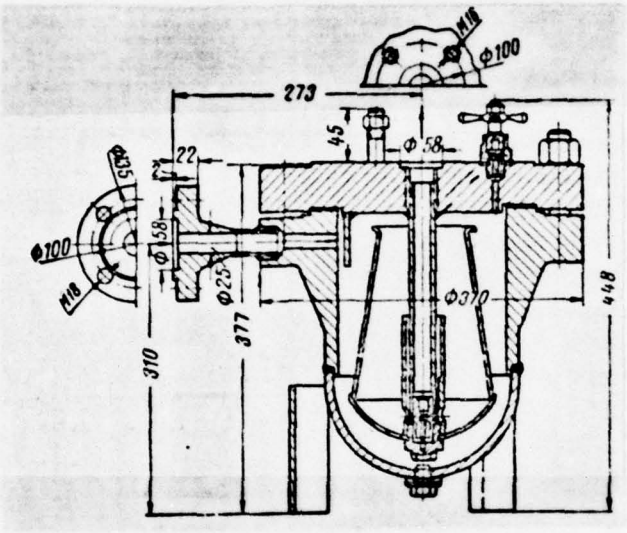


Fig. 5.19. Steam trap D_y-25 mm BKZ 5S-1-1. Weight 86 kg.

Page 71.

Steam traps and drainage controllers are establish/installed as far as possible nearer to the drain/vented steam line to avoid the high losses of pressure and heat on this section.

With above-ground laying of steam lines steam traps and

the drainage controllers are establish/installed in the special heated locations (booths) or in metallic boxes (Fig. 5.22) with heat insulation, placed either on the special pads n piers or on concrete pillows on the earth/ground under pier.

With multitube packing for each steam line, is provided for separate drainage controller. The setting up of one drainage controller on several steam lines or the unification of the drainage lines of steam lines is not recommended.

5.4. Flushing of the conduit/manifolds of water thermal grid/networks.

In the process of the production of the construction-assembly works into the conduit/manifolds of thermal grid/networks, fall the sand, scale, cutting of wood/tree, the pieces of construction materials, the electrodes, etc., which, as a rule, remain in the assembled conduit/manifolds.

To the delivery of thermal grid/networks into operation, these dirts must be removed.

Steam lines blow by vapor from heat and power plant or by boiler room. Issue pair is produced through special time/temporary exhaust pipes. Speed pair with blasting must exceed worker, how this allows the productivity of heat source.

Water grid/networks and condensers are washed in water (hydraulic flushing) or in water-air mixture (hydropneumatic flushing).

There are two stages of hydraulic washing: roughing and clean/finishing. With roughing flushing the conduit/manifolds charge by pressurized water 3 $\approx$ 4 atm(gage), and then water is thrown off through the open drainages at the end of the washed section.

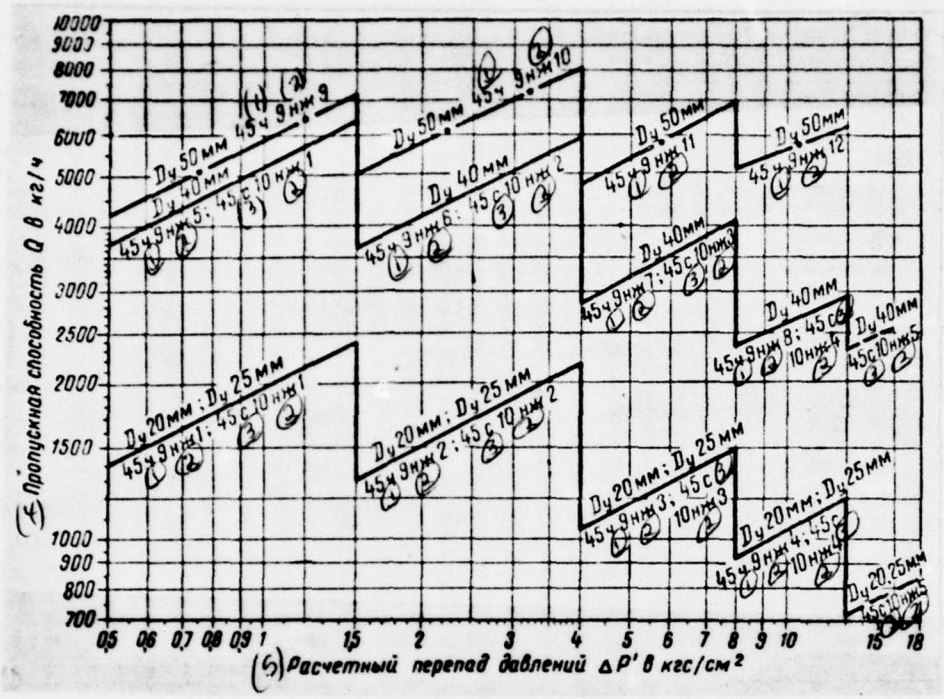


Fig. 5.20. Graph for determining the throughput capacity of the drainage controllers 45ch9nzh and 45ch10nzh from cold condensate. The conventional designations: ——— for the drainage controllers 45ch9nzh and 45s10nzh; - - - for the drainage controller 45s10nzh; —·— - for the drainage ccntroller 45ch9nzh.

Key: (1). h. (2). nzh. (3). s. (4). Throughput capacity Q in kg/h. (5). A design pressure differential Δ P' in kg/cm².

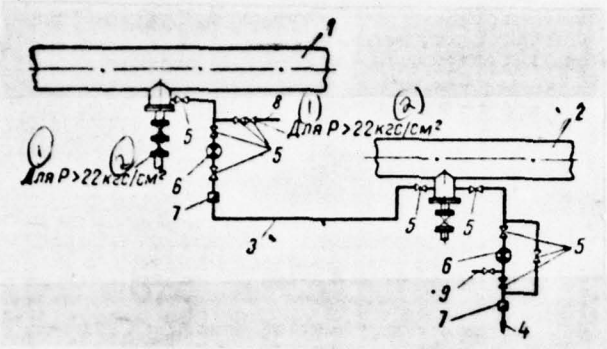


Fig. 5.21. Schematic of setting drainage controllers on the constant drainage of steam lines with $P > P_1$. 1 - steam line by pressure P kg/cm²; 2 - steam line by pressure P_1 by kg/cm²; 3 - condensate piping for the branch/removal of condensate from steam line 1 into steam line 2; 4 - condenser for the branch/removal of condensate from steam line 2 into common/general/total condensate piping; 5 - valve/gate; 6 - drainage controller; 7 - check valve; 8 - conduit/manifold of starting/launching blasting; 9 - control drain.

Key: (1). For. (2). kg/cm².

With clean/finishing flushing are utilized network pumps. They fill and make up grid/networks in this case by tap water.

With the underground packing of thermal grid/network, clean/finishing flushing is realize/accomplished by a passage of the circulating water through the sludge pans, adjustable at the end of the sections (on the course of water) in the assemblies of the sectionalizing catches (Fig. 5.23). Feeding and return lines in these assemblies they connect by the cross connections in which are set to two sluice valves with control drain valve between them. The diameter of cross connection is recommended to accept not less than 0.3 diameters of conduit/manifold. Sludge pans with grids, as a rule, remain for the subsequent heating period during which them they periodically clear.

At the termination of the first heating season, the sludge pans can be dismantled. Virtually in view of the complexity of disassembly, they are limited to removal from the sludge pans of grids.

With the above-grade packing of water grid/networks, the sludge pans are not establish/installed, and the clean/finishing flushing of grid/network occurs in the alignment procedure and operation through user and station sludge pans.

Condensers are washed in two stages:

by preliminarily tap water before the complete bright dipping of washing water and subsequently - by condensate until analysis shows the necessary quality of condensate.

Recently began to be applied the hydropneumatic flushing of both of water grid/networks and the condensate pipings by which are created turbulence of motion and shock effect.

The advantage of this method of flushing for the underground packing of thermal grid/networks is absence on the thermal grid/network of sludge pans, thanks to which substantially are reduced the dimensions of the camera/chambers in the sites of installation of the sectionalizing catches.

In hydropneumatic flushing (Fig. 5.24) are applied the

movable compressors of types VSK-1, AK-6, DK-9 by productivity Q = 5-6 m³/s with the pressure of the compressed air 6 atm(abs.).

For the water supply and air into the washed conduit/manifold, cut into two branch connections - one with check valve and valve/gate for the supply of air from blowing plant, another - with catch for a water supply of water pipe.

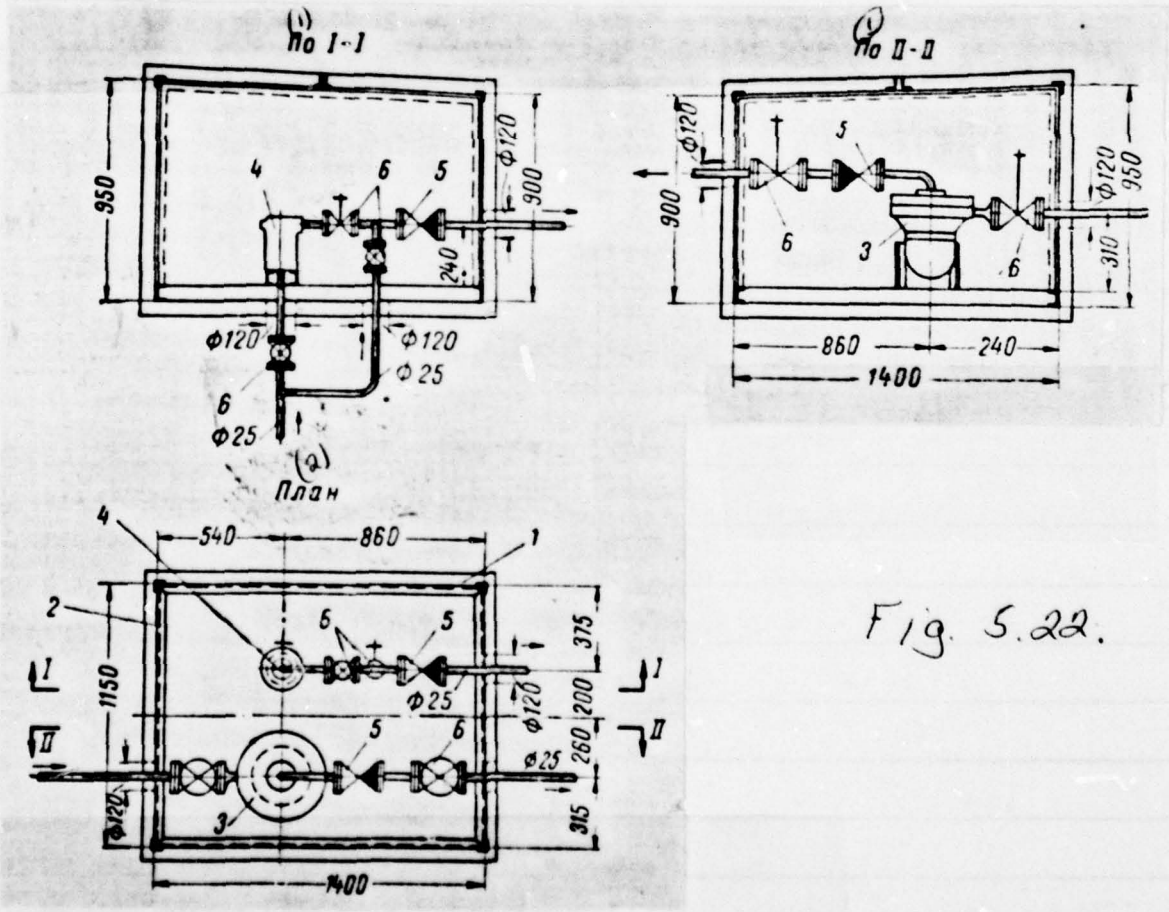


Fig. 5.22.

Fig. 5.22. Arrangement/position of steam trap BKZ and drainage controller 45ch9nzh in metallic box. 1 - isolation/insulation; 2 - box; 3 - steam trap BKZ; 4 - drainage controller 45ch9bk; 5 - check valve; 6 - valve/gate.

Key: (1). On. (2). Plan/layout.

Page 73.

For the issue of washing water and air from conduit/manifolds, are utilized drains, adjustable at the end of the washed section. The diameter of drains is selected depending on the diameter of the washed conduit/manifold (Table 5.13).

Water after flushing they lower into surface drains or in the pit of the camera/chamber, whence it they contiauously evacuate by movable pumps.

The best results of flushing are reached at the speeds of water-air mixture at the end of the section from 1.5 to 3 m/s. The consumption of water with hydropneumatic

flushing for obtaining the necessary speed can be accepted according to Table 5-14.

The necessary quantity of air can be determined by the experimental formula

$$W = G_в \left(1 - \frac{v_к}{v_{ср}}\right) м^3/сек, \qquad (5.5)$$

Key: (1). м³/с.

where $G_в$ is consumption of washing water in м³/с; $v_к$ is the final speed of mixture at the end of the washed section, taken from 1.5 to 3 м/с; $v_{ср}$ is the average conditional speed of the motion of water, taken about 1 м/с.

The pressure of water in water pipe must be not less than 2 kg/см².

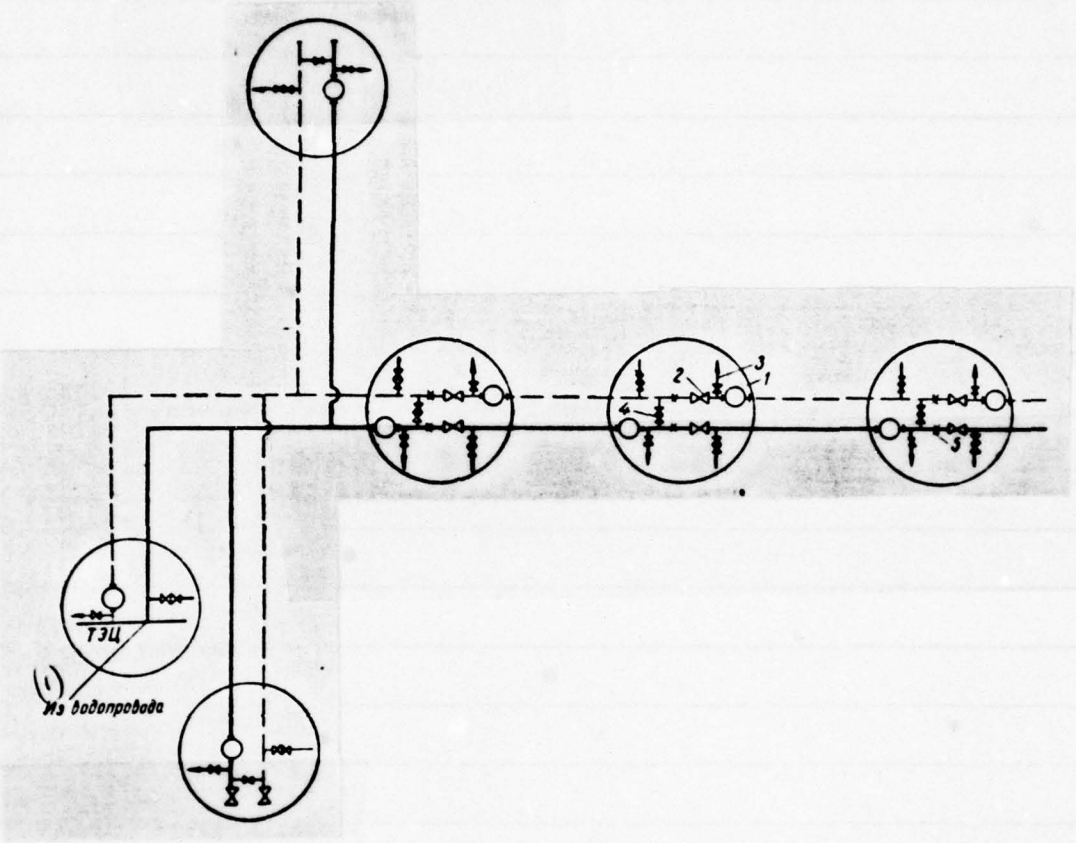


Fig. 5.23. Diagram of the arrangement of sludge pans for the flushing of water thermal grid/network: 1 - sludge pan; 2 - sectionalizing catch; 3 - drain; 4 - cross connection; 5 - fixed support.

Key: (1). From water pipe.

Table 5.13. Diameter of drains with the hydropneumatic flushing of conduit/manifolds.

(1) Условный проход промываемых труб D_y в мм	(2) До 200	250—400	500—800	(3) 900 и выше
(4) Условный проход спускного патрубка D_{y1} в мм	80	150	200	300

Key: (1). The internal diameter of the washed tubes D_y in mm. (2). To. (3). and it is above. (4). Conditional pass of drain D_{y1} in mm.

Table 5.14. Consumption of water for the flushing of conduit/manifolds with hydropneumatic method (experimental these heating system Lenenergo [Leningrad Regional Administration of Power System Management]).

(1) Условный проход промываемых труб D_y в мм	50	70	80	100	125	150	200	250	300
(2) Расход воды в т/ч	8	14	20	30	50	65	120	160	260

Key: (1). The internal diameter of the washed tubes D_y in mm. (2). Consumption of water in t/h.

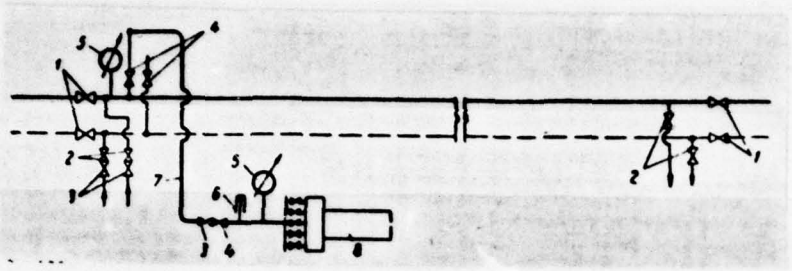


Fig. 5.24. Diagram of hydropneumatic flushing of water grid/networks. 1 - catch sectionalizing; 2 - catches locking; 3 - check valve; 4 - valve/gate on air duct; 5 - manometer; 6 - thermometer; 7 - rubber hose; 8 - compressor.

Page 74.

Air pressure by compressor must exceed the pressure of water not less than on 1 kg/cm^2.

5.5. Sludge pans.

For thermal grid/networks are applied the sludge pans:

washing (Table 5.15 and 5.16) to the operating pressure of water to 16 kg/cm² and temperature to 200°C for the internal diameters from D_y=150 mm to D_y=1000 mm;

station (Table 5.17) to the operating pressure of water to 10 kg/cm² and temperature to 200°C for the internal diameters from D_y=200 mm to D_y=1000 mm;

user on HVH 1280-59 to the operating pressure of water to 16 kg/cm² and temperature to 200°C for the internal diameters from D_y=40 mm to D_y=200 mm.

Washing sludge pans are applied both the time/temporary equipment in the hydraulic flushing of thermal grid/networks.

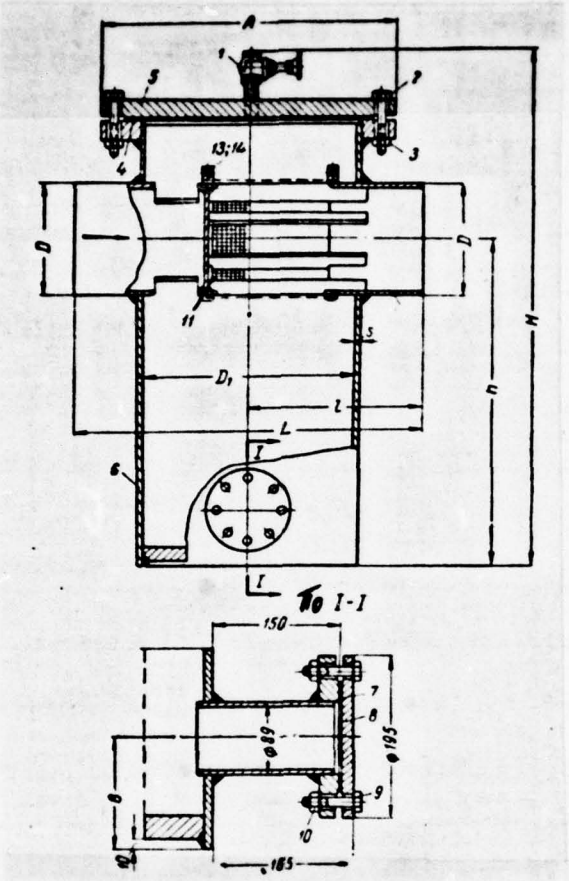


Fig. 5.25. Sludge pans washing D_y = 150-300 mm. 1 - valve/gate coupling; 2, 9, 13 - bolt; 3, 10, 14 - nut; 4, 7 - packing Paronit; 5, 8 - plug/silencer; 6 - housing; 11 - grid No 5-1.4.

Table 5.45. Washing sludge pans D_y 150-300 mm on NVN 1264-59 (Fig. 5.25).

Table 5.15. Washing sludge pans D_y 150-300 mm on MVN 1264-59 (Fig. 5.25).

(1) Условный проход грязевика D_y в мм	(2) Обозначение грязевика—номер МВН	(3) Основные размеры в мм									(4) Вес в кг	(5) Наибольшая осевая нагрузка в т
		D_1	s	D	H	h	L	l	A	B		
150	1264-11	325	8	189	953	600	620	310	460	115	136	12
175	1264-12	377	9	194	1007	620	670	335	520	120	190	12
200	1264-13	426	9	219	1061	650	720	360	580	125	247	20
250	1264-14	529	9	273	1271	800	840	420	705	135	413	30
300	1264-15	630	9	325	1428	900	980	490	840	140	626	45

Notes: 1. The housing of washing sludge pans is manufactured from seamless pipes according to GOST 8732-58* (for housing D_1 = 325; 377 mm) and from wrought pipes according to GOST 4015-58 (for housing D_1 = 426 mm and more) made of steel of brand st. 3. Riding-crops No 5-1, 4 are made according to GOST 3826-47 of the steel low-carbon zinc-coated wire according to GOST 3282-46.

2. Axial load on washing sludge pans from adjacent conduit/manifolds must not exceed greatest axial load, indicated in table.

Ke: (1). The internal diameter sludge pans Dy in mm. (2). Designation of sludge pan - number of MVN. (3). Basic dimensions in mm. (4). Weight in kg. (5). Greatest axial load in t.

Page 75.

Stationary station sludge pans are establish/installed in return lines of the thermal grid/networks before network pumps, in the thermal point/items of large enterprises and before booster pumps. Stationary sludge pans in the thermal point/items of separate buildings (customer) are provided for on delivery pipe in all cases, and on reverse/inverse - before flow meters, water meters and calorimeters.

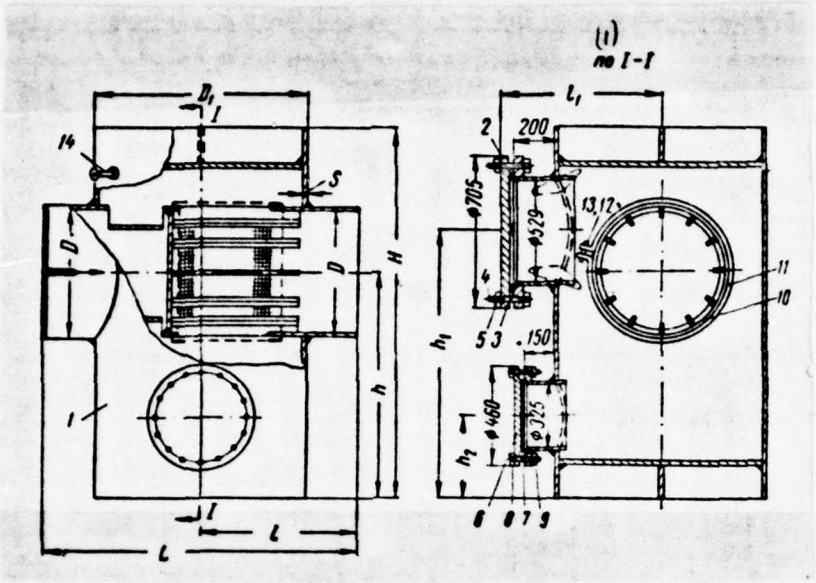


Fig. 5.26. Sludge pans washing D_y = 350-1000 mm 1 - housing; 2, 6 - plug/silencer; 3, 7 - packing; 4, 8, 12 - bolt; 5, 9, 13 - nut; 10 - grid; 11 - clamp; 14 - valve/gate.

Key: (1). on.

Table 5.16. Washing sludge pans 350-1000 mm on NVR 1272-59 (Fig. 5.26).

Table 5.16. Washing sludge pans D_y 350-1000 mm on MVN 1272-59 (Fig. 5.26).

(1) Условный проход грязевика D_y в мм	(2) Обозначение грязевика—номер МВН	(3) Основные размеры в мм										(4) Вес в кг	(5) Наибольшая осевая нагрузка в т
		D_1	s	D	H	h	L	l	l_1	h_1	h_2		
350	1272-21	820	9	377	1550	1000	1200	600	649	1100	350	947	60
400	1272-22			426	1600					1150		948	45
450	1272-23	920	9	478			1340	670	699		370	1200	50
500	1272-24			529	1700		1340	670		1250	370	1233	60
600	1272-25	1020	10	630	1800	1100	1500	750	749	1300	390	1513	80
700	1272-26	1220	12	720	1900	1200	1700	850	849	1350	440	2252	90
800	1272-27			820	2000		1800	900		1450		2387	120
900	1272-28	1420	12	920	2100		2000	1000	949	1500	470	3341	140
1000	1272-29			1020	2200	1250				1600		3465	180

The notes: 1 - the housing of washing sludge pans are manufactured from wrought pipes according to GOST 4015-58 from steel of brand St. 3. Grids No 5-1, 4 for sludge pans are manufactured according to GOST 3826-47 from the steel low-carbon zinc-coated wire according to GOST 3282-46.

2. See note 2 to Table 5.15.

Key: (1). The internal diameter of sludge pan Dy in mm. (2). Designation sludge pans - number of MVN. (3). Basic dimensions in mm. (4). Weight in kg. (5). Greatest axial load in t.

Page 76.

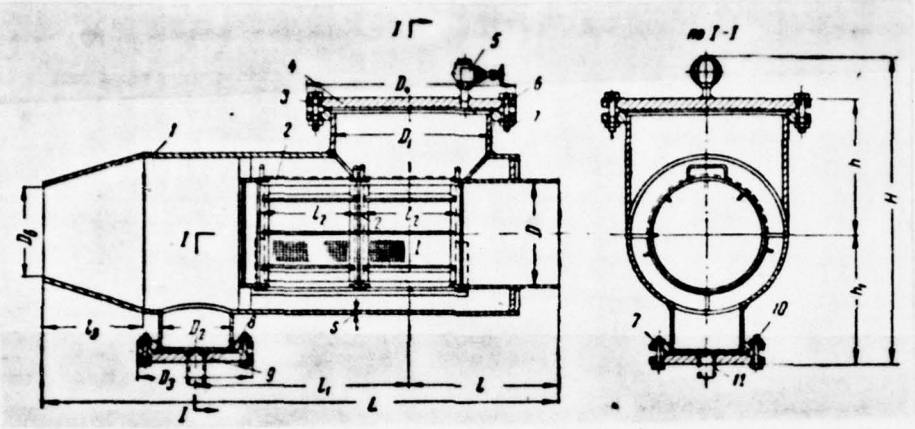


Fig. 5.27. Sludge pans are station. 1 - housing; 2 - filter; 3, 8 - packing; 4, 9 - plug/silencer; 5 - valve/gate coupling; 6, 10 - bolt; 7 - nut; 11 - discharge pipe.

Table 5.17. Station sludge pans D_y 200-1000 mm on MVN 1244-59 (Fig. 5.27).

(1) Условный проход грязевика D_y в мм	(2) Обозначение грязевика—номер МВН	(3) Основные размеры в мм															(4) Вес в кг
		D	D_1	s	D_2	D_3	D_4	D_5	L	l	l_1	l_2	l_3	H	h	h_1	
200	1244-21	219	377	9			500	207	1490	390	560	250	378	740	323	291	220
250	1244-22	273	426	6			565	259	1575	420	610	280	383	817	365	326	236
300	1244-23	325	478	6	219	335	615	309	1635	445	635	300	393	889	397	366	287
350	1244-24	377	529	6			670	359	1705	480	670	320	393	951	429	396	342
400	1244-25	426	630	7			780	414	2030	560	820	410	489	1064	492	446	502
450	1244-26	478	720	7			895	466	2302	630	930	480	581	1170	548	496	682
500	1244-27	529	820	8	273	390	1010	517	2632	680	1070	560	691	1294	610	558	940
600	1244-28	630	920	9			1110	616	2740	730	1130	600	689	1428	674	628	1217
700	1244-29	720	1020	10	325	440	1220	706	3002	830	1240	640	710	1553	738	689	1613
800	1244-30	820	1220	12			1460	804	3605	930	1510	820	943	1761	836	799	2214
900	1244-31	920	1420	12	426	565	1685	902	4176	1040	1680	900	1185	2015	964	925	3257
1000	1244-32	1020	1420	12			1685	1000	3943	1040	1680	900	952	2015	964	925	3180

Note. The housing of station sludge pans is manufactured from seamless pipes D_1 = 377 mm according to GOST 8732-58 and of the welded is rough D_1 = 426 mm and more GOST 4015-58 of steel of brand St. 3. Filters for sludge pans are manufactured from brass grid No 2, 5 according to GOST 6613-53.

Key: (1). The internal diameter of sludge pan Dy in mm. (2). Designation of sludge pan - number of MVN. (3). Basic dimensions in mm. (4). Weight in kg.

5471D

Page 77.

Section II

DIAGRAMS AND CALCULATIONS OF THERMAL NETWORKS.

Chapter 6

DIAGRAMS OF THERMAL GRID/NETWORKS.

Thermal networks are one of the nodes of the complex of the constructions of the system of central heat supply, which includes heat source, thermal grid/network and the local systems of consumers of heat.

According to their designation/purpose thermal

grid/networks in accordance with classification SNIP [СНиП - Construction norms and regulations] II-6.10-62 are subdivided into the following categories:

main-line are from heat source to the territory of industrial enterprises and city blocks (or quarters) of the populated places;

distributive - from main-line thermal grid/networks on the territory of industrial enterprises and city blocks (or quarters) of populated places to the nodes of the branches of thermal grid/networks to separate buildings;

branch to separate buildings are from distributive thermal grid/networks (sometimes from the main-line) to entrance (to the edge of foundation or wall of building).

The diagrams of thermal grid/networks depending on the mutual arrangement/position of heat sources and consumers can be:

radiation (radial) with packing from one source of heat of separate main lines into areas of the arrangement/position of thermal users (Fig. 6.1), these main

lines can be single or those who were duplicate/backup/reinforced;

circular with packing from heat source to one group of users it is not less than two main lines, which are connected between themselves in area of the arrangement/position of users. providing bilateral heat input.

With heat supply from several sources, radiation main lines, as a rule, are connected between them bridges (Fig. 6.2).

The cross connections between main lines one or of several heat sources are intended for conducting the summer repairs with the smallest limitation of the users of everyday hot water supply.

Radiation diagrams with the duplicated/backed up/reinforced main lines or annular are applied for a heat input to users, who do not allow/assume interruptions in heat input.

Depending on heat carrier, thermal networks are subdivided into conducting, steam and the grid/network of

collection and return of condensate (condensate ducts).

Water thermal grid/networks can be closed and those who were opened depending on the method of heat input to the local systems of hot water supply.

In closed system the water into the local system of hot water supply enters from the system of drinking water pipe and is preheated in the water-to-water preheaters, establish/installed on the input/introduction of thermal grid/network into each building or the group of buildings.

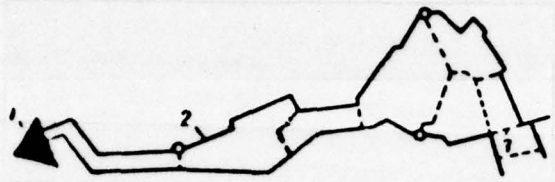


fig. 6.1.

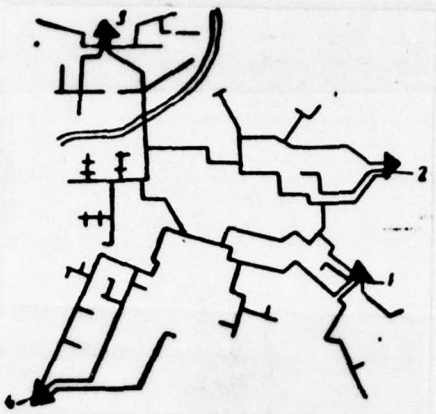


fig. 6.2.

Fig. 6.1. Radiation diagram of thermal grid/networks of city with one source of heat 1 - heat source; 2 - main line; 3 - cross connection.

Fig. 6.2. Diagram of thermal grid/networks of city with several sources of heat 1, 2, 3, 4 is heat sources.

Page 78.

In the open system the water for the local system of hot water supply is take/selected directly from thermal grid/network during its input/introduction into each building or the group of buildings.

The selected from thermal grid/networks water is compensated for concealed by a quantity of water on heat and power plant or in boiler room. Water networks are subdivided into one, two, three- and four-pipe.

Single-pipe water grid/networks apply for the centralized water supply on everyday hot water supply or to technological processes during installation in all users of the local tanks of the storage battery/accumulators of hot water, designed to the supply of an hourly mean (for days) quantity of water, or during the connection of users with the 24-hour continuous consumption of water.

In single-pipe systems for a joint heat input to heating, ventilation and hot water supply, the water, cooled in the heating systems and ventilation, is utilized completely for everyday hot water supply.

Equality in the consumption of the water, entering from heat source and used to hot water supply, is reached by an increase in its temperature to 180-200°C, by an increase in the useful temperature differential, by supply from the basic source of heat of base load and by the local accumulation of hot water after heating systems.

Are developed two in principle different diagrams - with the packing of one tube to each user (Fig. 6.3) and with the packing of one tube only on the transit section of main line.

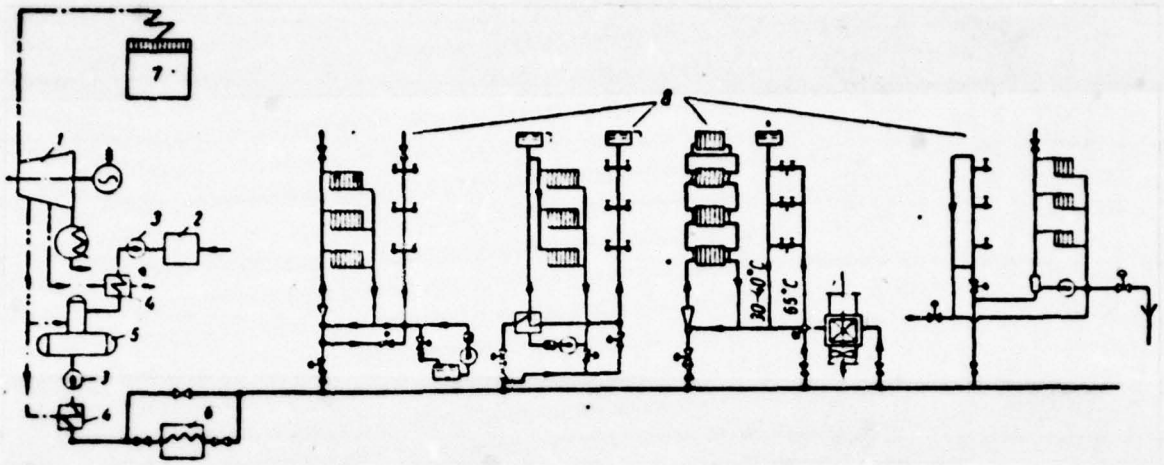


Fig. 6.3. Schematic diagram of single-pipe water grid/network with heat supply from heat and power plant 1 - turbine; 2 - water purifier; 3 - network of pump; 4 - preheaters of network water; 5 - deaerator; 6 - peak boiler; 7 - energy boiler; 8 - local systems of users.

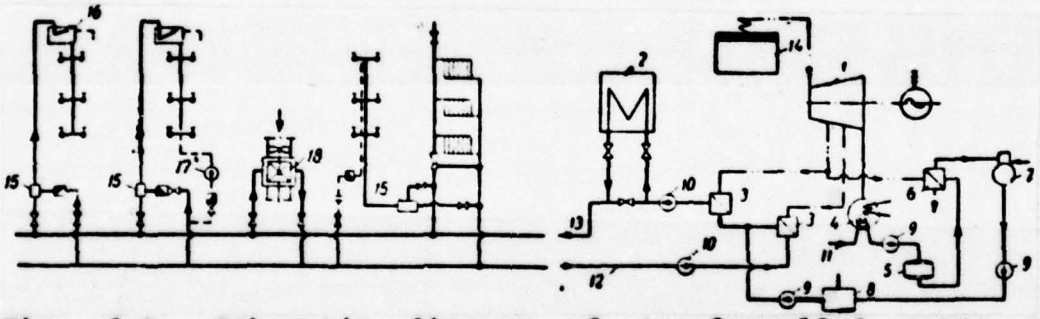


Fig. 6.4. Schematic diagram of two-funnelled water network with direct water collecting to hot water supply is open system. Source of heat of heat and power plant 1 - turbine; 2 - peak boiler; 3 - preheater of network water; 4 - condenser/capacitor; 5 - water purifier; 6 - preheater

of makeup water; 7 - vacuum deaerator; 8 - tank-accumulator; 9 booster pumps; 10 - network pumps; 11 - pipeline of water of drinking water pipe; 12 - return line; 13 - delivery pipe; 14 - energy boiler; 15 - mixer; 16 - tank is the storage battery/accumulator of the local system of hot water supply; 17 - circulating pump of the local system of hot water supply; 18 - heater of ventilation system.

Page 79.

In the second diagram the heat source, take the swings of thermal load, is placed in area of thermal users in the node of the transfer/transition of single-pipe main line to two-funnelled thermal grid/networks.

The first diagram can be realized without plum, if in all users the ratio of the neutral (per week) load of hot water supply to the calculated hour load of heating comprises not less than 0.55-0.65. The second diagram can be always carried out without the plum of water. In the ratio of hourly mean (per week) load of hot water supply to the calculated hour load of the heating of order

20-25o/o, this diagram provides the coefficient of heat transfer of approximately 0.5.

ab Two-funnelled water network are basic for a joint heat input to heating, ventilation and the everyday hot water supply of residential areas and industrial enterprises (Fig. 6.4 and 6.5). Two-funnelled water grid/networks are applied also for a water supply to everyday hot water supply or to the technological processes when the diurnal conditions/mode of the consumption of water is led to the dropping of water lower than permissible limits and in this case is absent the possibility of installation in the users of the local tanks of accumulators.

Three-tube grid/networks have two delivery pipes even one common/general/total reverse/inverse (Fig. 6.6). In one of the delivery pipes, is maintained a constant temperature of water. This pipeline is intended for a heat input to technological equipment and to the local systems of hot water supply.

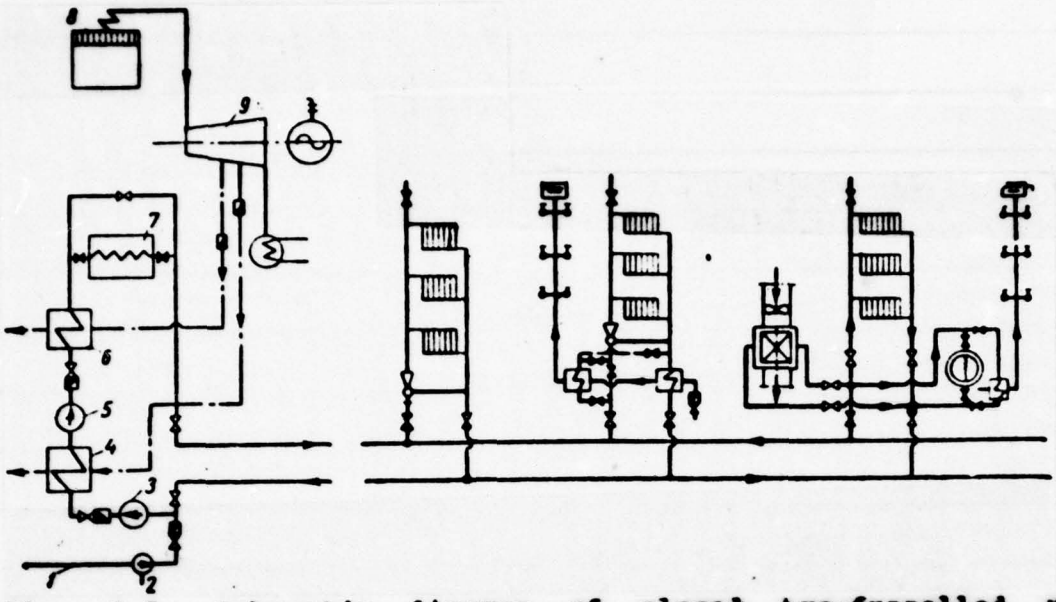


Fig. 6.5. Schematic diagram of closed two-funnelled water grid/network 1 - pipeline of makeup water; 2 - makeup pump; 3 - first group of network pumps; 4 - first stage of network preheaters; 5 - second group of network pumps; 6 - second step/stage of network preheaters; 7 - peak boiler; 8 - boiler energy; 9 - turbine.

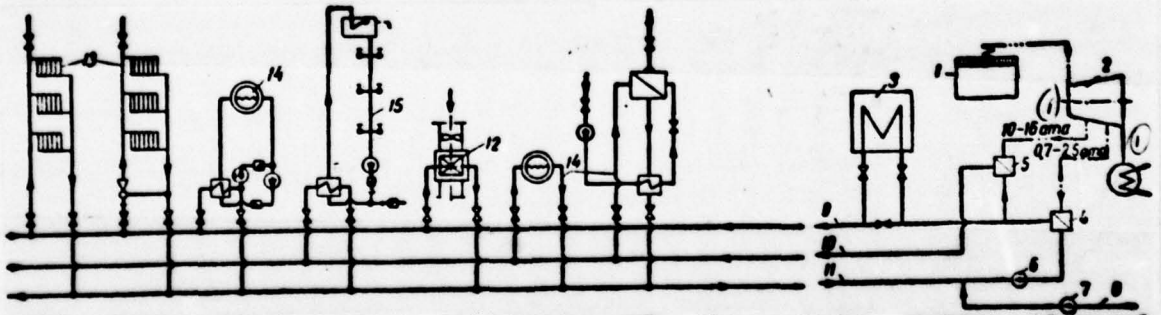


Fig. 6.6. Fundamental diagrams of three-tube water thermal grid/network. Source of heat of heat and power plant with

turbines of the type PT 1 - energy boilers; 2 - turbine; 3 - peak boilers; 4 - preheater of network water of first stage; 5 - preheater of network water of the second step/stage; 6 - network pump; 7 - makeup pump; 8 - pipeline of makeup water; 9 - delivery pipe for heating and ventilation; 10 - feeding turboconductor for hot water supply and technology; 11 - common/general/total reverse/inverse turboconductor; 12 - local system of ventilation; 13 - local systems of water supply to shops and everyday locations; 14 - local systems of technological pipelines; 15. the local system of hot water supply.

Key: (1). atm(abs.).

Page 80.

In the second, delivery pipe, intended for a heat input to the heating systems and ventilation, the temperature of water is changed on heating graph.

Technological equipment from which is possible the entrance into network water of harmful substances, is connected to the common/general/total thermal grid/network

through intermediate water outline/contour, the pressure of water in which must be lower than in thermal grid/network.

In three-tube systems where this is possible from the parameters of technological processes, is applied the multistage cooling of network water with the series connection of heat exchangers.

In certain cases three-tube system conditionally is called the combination of the two-funnelled circulation system for a heating and ventilation from single-pipe wash off for hot water supply.

Four-pipe water grid/networks are the combination of two two-funnelled circulation water grid/networks: one for a heat input to heating and ventilation and the second for a heat input to the same users to hot water supply or to technolcgical process (Fig. 6.7).

Steam thermal grid/networks (steam lines) are classified according to the initial parameters of the transported vapor (Fig. 6.8) close in the assigned/prescribed pressure pair users with the difference of 3-5 at, as a rule, they are supplied with vapor from one system, which feeds of the

pairs of the greatest pressure.

Of separate users, the expending pairs of lower pressure during the input/introduction of steam grid/network, are provided for reduction or reduction-damping installations.

During obtaining the pair from industrial boiler rooms with the parameters pair on boilers than higher requiring to all users pair on boilers than higher requiring to all users in boiler room is provided for central reduction or reduction-damping device. Centralized reduction of pressure pair in boiler room facilitates the selection of tubes and fittings in steam network, raises the reliability of operation and simplifies operation.

Condensate ducts are subdivided into composite and forcing.

Condensate from heat exchangers on composite condensate pipings is supplied to receiver tanks condensate pumping, whence on forcing condensate pipings with pumps it is supplied to source of heat (Fig. 6.9).

Drainage controllers can supply condensate to the

common/general/total grid/network of composite condensate pipings with the difference in pressure the pair before separate drainage controllers not more than 2.5-3 atm(abs.). With the larger difference of pressures, are provided for the separate systems of composite condensate pipings or is aligned pressure in special small tank-expanders. The height/altitude of the installation of small tank-expander must be sufficient for the supply of condensate on composite condensate pipings to receiver tanks.

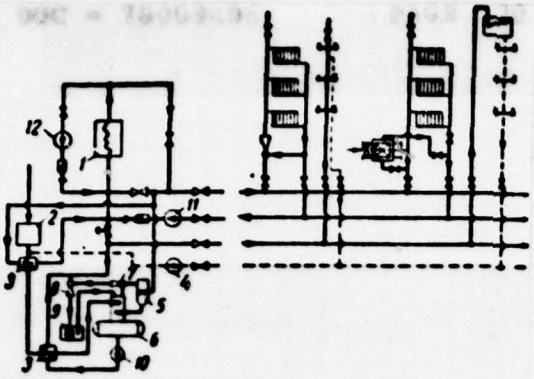


Fig. 6.7.

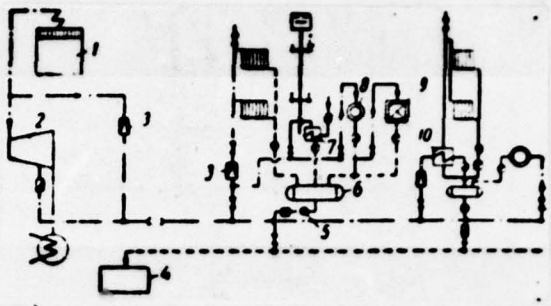


Fig. 6.8.

Fig. 6.7. Schemaic diagram of four-pipe water network. Heat source boiler room 1 - hot-water boiler; 2 - water purifier; 3 - water-to-water preheaters and the coolants of makeup water; 4 - circulating pump; 5 - expander; 6 - vacuum deaerator; 7 - steam-jet ejector; 8 - water-jet ejector; 9 - small tank for deaeration; 10 - makeup pump; 11 network pumps; 12 - recirculating pump.

Fig. 6.8. Schematic diagram of steam grid/network with return of condensate 1 is boiler of steam; 2 turbine; 3 - reduction-damping installation; 4 - receiving tank of production condensate; 7 - steam-water preheater of hot water supply; 8 - technological heat exchanger; 9 - heater of ventilation system; 10 - steam-water preheater of water heating system.

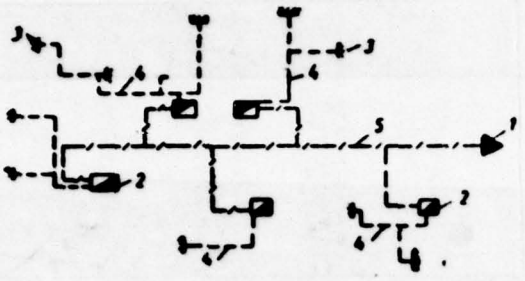


Fig. 6.9. Diagram of composite and head condensate pipings 1 - heat source; 2 - condensate pumping; 3 - users pair; 4 - composite condensate pipes; 5 - booster condensate pipes.

Page 81.

Small tank-expanders are establish/installed in one system of composite condensate pipings in one mark which is defined for most the adversely arranged/located user both from the distance of distance from receiver tank and from the mark of the sex/floor of building.

The pairs of secondary effervescence in small tank-expanders with a small quantity it is derive/concluded outside, and with considerable (0.1 t/h and more) - it is utilized in users.

Condensate pumping should be placed in industrial buildings with large return of condensate 3-5 t/hø and more. To receiver tanks these pumping is supplied the condensate from the closely spaced users with the smaller yield of condensate.

A quantity of pumping, workers to the common/general/total system of forcing condensate pipings, is not virtually limited, therefore, as a rule, is erected one system of forcing condensate pipings.

Several systems of forcing condensate pipings can be erected in main-line thermal grid/networks with the return of condensate to large heat source from separate enterprises with different conditions/modes in steam consumption.

The systems of composite and forcing condensate pipings are fulfilled closed. Overpressure is created by steam pillow in receiver tanks of condensate and is accepted not less than 0.05 and not more than 0.5 kg/cm^2.

For the formation of steam pillow, it is utilized

pairs from the expansion tank by condensate pumping or from the system of steam lines.

The open systems of composite condensate pipings are applied as exception/elimination, at a low pressure pair in users (to 2 kg/cm²) or with collection or return of the greased condensate.

Booster condensate pumps both in that which was opened and in closed systems must constantly be located under overpressure independent of area relief and conditions/mode of the return of condensate.

With the above-grade packing of forcing condensate pipings, must be provided for the continuous evacuation of condensate or their heating at the minus temperatures of surrounding air.

Chapter 7

DETERMINATION OF HEAT CONSUMPTION.

7.1. The hourly consumptions of heat for heating and ventilation.

Heat consumption for heating are accepted according to the projects of the local heating systems of habitable and public buildings. For cities, the populated places, the group of buildings or separate buildings, it is possible to determine heat consumption according to the combined indices.

For determining the maximum hourly consumptions of heat for heating from the combined indices, are applied the averaged specific heating characteristics of buildings, which are heat rate on 1 m^3 of building on external measurement for one degree of a difference in the temperatures between

the averaged calculated temperature of air heated indoors and the calculated temperature of surrounding air for the planning of heating. Accordingly the maximum hourly consumption of heat for heating are determined from the formula

$$Q_o = q_o(t_{вн} - t_{н.о})V_н \text{ ккал/ч}, \quad (7.1)$$

(1)

Key: (1) kcal/h.

where q_o - the specific heating characteristic of habitable and public buildings when $t_{н.о}$ in kcal/m³ h deg; $t_{вн}$ - the averaged calculated temperature of internal air of the heated buildings in °C; they accept according to table 7.1; $t_{н.о}$ - the calculated temperature of surrounding air for the planning of heating in °C; see Table 1.3; $V_н$ - the external construction volume of buildings (without basement) in m³.

The specific heating characteristics of habitable and public buildings are determined according to materials of the standard series, used for the building-up of this area. In the absence of the information about a standard series of buildings specific heating characteristics can be determined according to the curve/graph of Fig. 7.1 or according to table 7.2.

In table 7.2 and on the graph of Fig. 7.1 are given specific heating characteristics $q_0^{(-30)}$. referred to the calculated temperature of surrounding air $t_{н.о}=-30°C$, in connection with this specific heating characteristics for other climatic areas recount by the formula

$$q_0 = q_0^{(-30)} \eta \text{ ккал/м}^3 \text{ ч град}, \quad (7.2)$$

Key: (1). kcal/m³ h deg

where η is the coefficient, which considers the climatic conditions of area, are accepted:

(1) при $t_{н.о} > -10°C$ ..... $\eta = 1.2$
" $t_{н.о} = -20°C$ ..... $\eta = 1.1$
" $t_{н.о} < -40°C$ ..... $\eta = 0.9$

Key: (1). with.

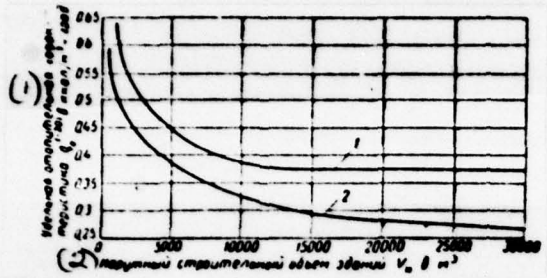


Fig. 7.1. Graph of specific heating characteristics of habitable and public buildings depending on external construction volume of buildings when $t_{n.o} = -30°C$ 1 - for buildings constructed afterward 1958; 2 - for buildings of building to 1958.

Key: (1). Specific heating characteristic in kcal/m³ h deg. (2). full-scale construction volume of buildings in m³.

Table 7.1. Averaged calculated temperatures of internal air (on SNIP II-G.10-62).

(1) Назначение зданий	(2) $t_{вн}$, °C
(2) Жилые здания, гостиницы, общежития, административные здания	+18
(3) Учебные заведения, общеобразовательные школы, школы-интернаты, лаборатории, предприятия общественного питания, клубы, дома культуры	+16
(4) Театры, магазины, прачечные, пожарные депо	+15
(5) Кинотеатры	+14
(6) Гаражи	+10
(7) Детские ясли-сады, поликлиники, амбулатории, диспансеры, больницы	+20
(8) Бани	+25

Note. In the absence of the enumeration of public buildings with the indication of their designation/purpose the calculated temperature of internal air for all buildings is accepted $t_{вн}$=+18°C.

Key: (1). Designation/purpose of buildings. (1A). in °C. (2). Habitable buildings, hotels, hostels, administrative buildings. (3). The educational institutions, general education schools, boarding schools, laboratories, enterprises of public nutrition, club/puffs, the houses of culture. (4). Theaters, magazines, laundry, fire stations. (5). Cinemas. (6). Garages. (7). Children's kindergartens, polyclinics, dispensaries, dispensaries, hospitals. (8). Baths.

Page 83.

The volume of one building is accepted: during the planning of main-line thermal grid/networks - by the average/mean external construction volume of one building in city block; during the planning of distributive thermal grid/networks - for each building by its external construction volume, and in the absence of these data - by the following volume of one building in city block; during

the planning of branching of thermal grid/networks to separate buildings - on the external construction volume of this building.

The maximum hourly consumption of heat for the heating of public buildings can be accepted tentatively 25o/o of the maximum hourly consumption of the heat of habitable buildings.

Heat rates for heating on 1 m^2 by the vein/strand of the areas, which consider the climatic conditions of area, can be determined by the curve/graph of Fig. 7.2.

Heat consumption for heating at the temperatures of surrounding air, different from calculated, they accept: if the temperature of surrounding air is lower than calculated - equal to the maximum hourly consumption of heat, determined by formula (7.1); if the temperature of surrounding air is higher than calculated - it is proportional to a calculated difference in the temperatures by the formula

$$Q_0^t = Q_0 \frac{t_{вн} - t_н^t}{t_{вн} - t_{н.о}} \qquad (7.3)$$

where $t_н^t$ is the temperature of surrounding air at which is determined the heat consumption, into °C.

Heat consumption for the ventilation of the public buildings in which they design/project plenum ventilation with the preheating of air, are accepted according to the projects of local ventilation systems. When the projects of local systems are absent, heat consumption for these buildings (besides unique buildings - the theaters, high-altitude the like, and also buildings with air conditioners) can be determined according to amalgamated indices.

Table 7.2. Specific heating characteristics of habitable and public buildings depending on the height of building-up when $t_{н.о} = -30°C$ (on SNIP II-A.10-62).

(1) Этажность застройки	(2) $q_0^{(-30)}$, в ккал/м³ ч град
(3) 1	0.6—0.7
2—3	0.4—0.5
4—5	0.35—0.4
6 и более этажей	0.3—0.4

Note. As pi the absence of the data on number of floors of public buildings specific heating nature for these buildings is acquired equal to 0.4 kcal/m³ h deg.

Key: (1). Height of building-up. (2). in kcal/m³ h deg. (3). and more decks.

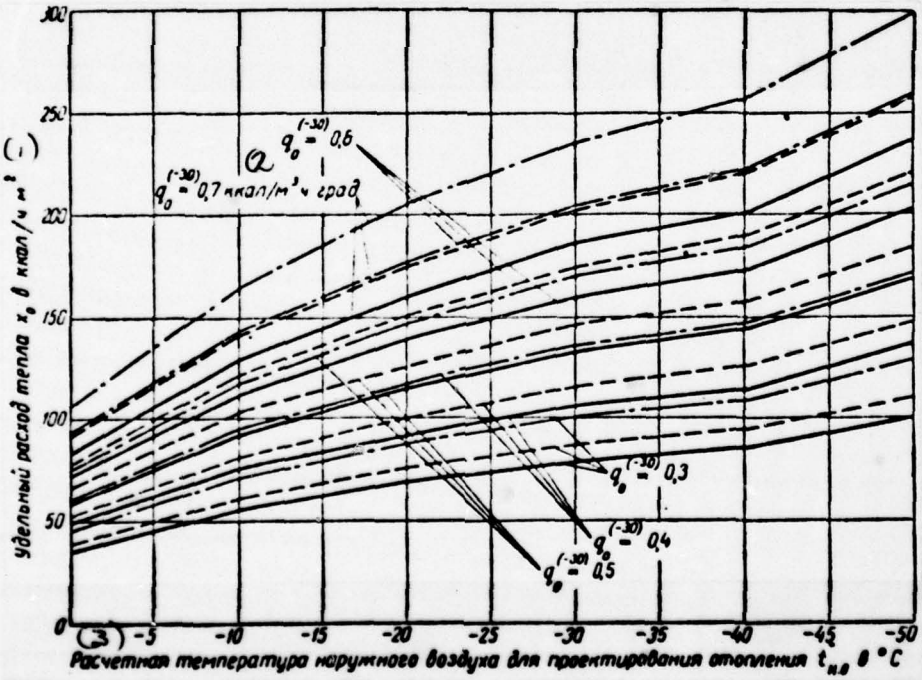


Fig. 7.2. Graph of heat rates on 1 m² by the vein/strand

of area —— curved x_0 in the ratio of external construction in volume to by the vein/strand of the area of building ω = 5.5 $м^3/м^2$; - - - - the same, with ω = 6 $м^3/м^2$; —-— the same, with ω = 7 $м^3/м^2$. [illegible] Key: (1). Heat rate x_0 in kcal/h $м^2$. (2). kcal/$м^3$ h deg. (3). The calculated temperature of surrounding air for the planning of heating $t_{н.о}$ in °C.

Page 84.

For determining the maximum hourly consumptions of heat for ventilation according to the combined indices, are applied the specific ventilation characteristics of buildings, which is heat rate on 1 $м^3$ of the ventilation building on external measurement for one degree of a difference in the temperatures between the averaged calculated temperature of air ventilation indoors and the calculated temperature of surrounding air for the planning of ventilation. Accordingly the maximum hourly consumption of heat for ventilation is determined from the formula:

$$Q_в = q_в (t_{вн} - t_{н.в}) \text{ ккал/ч}, \qquad (7.4)$$

where $q_в$ - the specific ventilation characteristic of public buildings in kcal/$м^3$ h deg; $t_{н.в}$ - the calculated temperature

of surrounding air for the planning of ventilation in °C, see Table 1.3.

The specific ventilation characteristics of public buildings are accepted according to the standard projects of buildings, and in their absence - depending on the designation/purpose of buildings according to table 7.3.

The specific ventilation characteristics of public buildings are accepted according to the standard projects of buildings, and in their absence - depending on the designation/purpose of buildings according to table 7.3.

In the absence of the list of public buildings with the indication of their designation/purpose the averaged specific ventilation nature is acquired equal to $q_0 = 0.2$ kcal/m³ h deg; in this case during the determination of heat consumption for ventilation from formula (7.4) is considered the total external volume of all public buildings, which is accepted according to the data of the general plans of cities, but if data no - take as equal to 30o/o of the volume of habitable buildings.

Heat consumption for ventilation at the temperatures of

surrounding air, different from the calculated, they accept: if the temperature of surrounding air is lower than calculated - equal to the maximum ourly consumption of heat, determined by formula (7.4), which is reached by reducing the multiplicity of the exchange of air during this period; if the temperature of surrounding air is higher than calculated - it is proportional to a calculated difference in the temperatures by the formula

$$Q_в^н = Q_в \frac{t_{вн} - t_н^н}{t_{вн} - t_{н.р}} \text{ kcal/h.} \quad (7.5)$$

(1)

For tentative calculations it is possible to accept that the maximum hourly consumption of heat for the ventilation of public buildings comprises approximately 30-50o/o of of the corresponding consumption for heating or 7-12.5o/o of heat consumption for the heating of habitable buildings.

The specific hourly consumptions of heat for one inhabitant it is possible to determine on the curve/graph of Fig. 7.3 during compilation of which the heat consumption for the ventilation of public buildings is taken into account in size/dimension of 30o/o of heat consumption for their heating.

Heat consumption for heating, ventilation and the

technological processes of industrial buildings are determined according to the projects of local systems or strengthened indices on the basis of the commands of the specialized planning organizations.

7.2. The hourly consumptions of heat for everyday hot water supply.

Heat consumption for the everyday hot water supply of separate habitable, public and industrial buildings or group of one-type buildings are determined according to the norms of the consumption of hot water with temperature of 65°C, given in SNIP II-g.8-62. The maximum hourly consumption of heat for hot water supply for the days of the greatest water consumption $Q_r^{макс}$, and also hourly mean heat consumption per week $Q_r^{ср.ч}$ for the habitable and public buildings of different designation/purpose is determined from the formulas, given in table 7.4. The values of the variation factors of the consumption of hot water are given in table 7.5.

Hourly mean heat consumption for hot water supply for

the days of the greatest water consumption is determined from the formula

$$Q_r^{cp} = k_c Q_r^{cp.n} \text{ kcal/h.} \quad (7.6)$$

where k_c is a coefficient of the diurnal nonuniformity of heat consumption per week; they accept for habitable and public buildings $k_c = 1.2$, for industrial buildings and enterprises - $k_c = 1$.

Heat consumption for the everyday hot water supply of city blocks or quarters of cities and populated places, and also industrial enterprises for the days of the greatest water consumption are determined from the formulas: hourly mean

$$Q_r^{cp} = k_c \Sigma Q_r^{cp.n} \text{ kcal/h.} \quad (7.7)$$

maximum hour

$$Q_r^{max.c} = k_4 Q_r^{cp} \text{ kcal/h.} \quad (7.8)$$

where $Q_r^{cp.n}$ - hourly mean the heat consumption per week for the hot water supply of each building, determined by the formulas, given in table 7.1, in kcal/h; k_c - the coefficient of the diurnal nonuniformity of heat consumption per week; they are for the populated places $k_c = 1.2$, and for industrial enterprises $k_c = 1$; k_4 is a coefficient of hour nonuniformity of heat consumption for the days of the greatest water consumption; they accept for the populated places $k_4 = 1.7 \div 2$; and for industrial enterprises $k_4 = 1$.

Table 7.3. Specific ventilation characteristics of public buildings (on SNIP II-g.10-62).

(1) Назначение зданий	(2) Удельные вентиляционные характеристики $q_в$ ккал/м³ ч град
(3) Административные здания, здания научно-исследовательских и проектных институтов	0.18
(4) Клубы	0.2
(5) Театры, кинотеатры	0.4
(6) Магазины, учебные заведения, пожарные депо	0.1
(7) Поликлиники, диспансеры, амбулатории	0.5
(8) Больницы	0.3
(9) Бани, лаборатории	1
(10) Предприятия общественного питания, гаражи	0.7
(11) Прачечные	0.6
(12) Детские ясли-сады	0.1
(13) Школы общеобразовательные	0.08

Note. When the enumeration of public buildings is absent, the averaged specific ventilation characteristic are accepted as equal to 0.2 kcal/m³h deg with to the total volume of all public buildings.

Key: (1). Designation/purpose of buildings. (2). Specific ventilation characteristics in kcal/m³ h deg. (3). Administrative buildings, the buildings of scientific research and design institutes. (4). Club/puffs. (5). Theaters, cinemas. (6). Magazines, the educational institutions, the fire stations. (7). Polyclinics, dispensaries, dispensaries. (8). Hospitals. (9). Baths, laboratories. (10). Enterprises of public nutrition, garages. (11). Laundry. (12). Children's kindergartens. (13). Schools are general education.

Page 85.

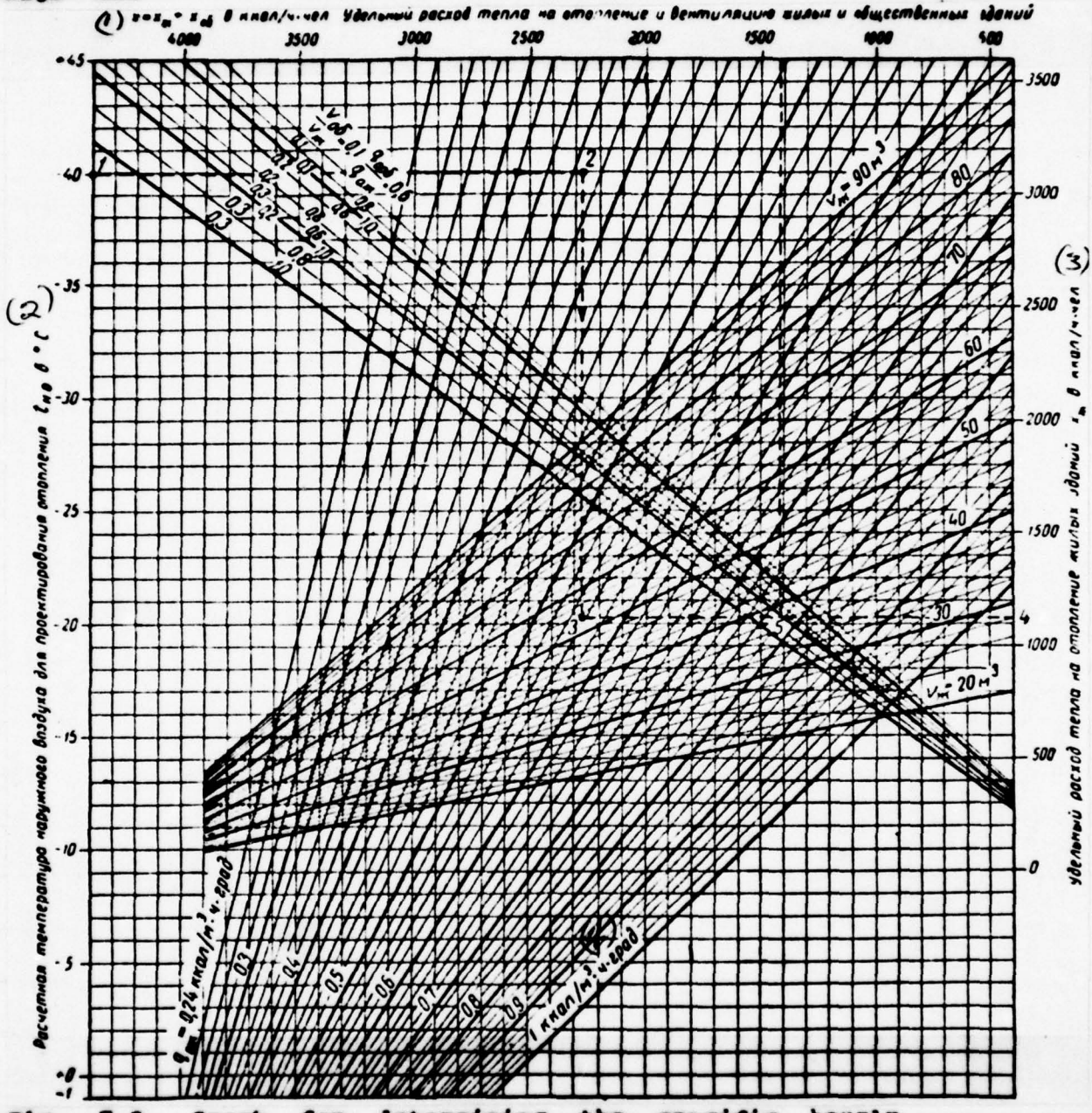


Fig. 7.3. Graph for determining the specific hourly consumptions of heat for heating and ventilation of

habitable and public buildings for one person. $q_{0.ж}$; $q_{0.об}$ - the specific heating characteristics of habitable and public buildings; $v_ж$; $v_{об}$ is a specific external volume of habitable and public buildings to one person $v_ж$ - м³/man; f is a norm by the vein/strand of area to man in м²/pers; ω is the ratio of the external construction volume to by the vein/strand of the area of building in м³/м².

Key: (1). In kcal/h•pers heat rate for heating and ventilation of habitable and public buildings. (2). The calculated temperature of surrounding air for the planning of heating in °C. (3). Heat rate for the heating of habitable buildings in kcal/м•pers (4). kcal/м³•h•deg.

Page 86.

Table 7.4. Formulas for determining the maximum hourly consumptions of heat for everyday hot water supply for the days of the greatest water consumption and hourly mean per week by separate habitable, public and industrial buildings or the group of one-type buildings.

(1) Потребители	(2) Единицы потребления	(3) Расчетные формулы для определения расходов тепла на горячее водоснабжение: (4) максимальных часовых за сутки наибольшего водопотребления $Q_г^{макс}$ в ккал/ч	(5) среднечасовых за неделю $Q_г^{ср.н}$ в ккал/ч	(6) Количество единиц потребления, m	(7) Коэффициент неравномерности расхода горячей воды, k
(8) Жилые дома (10) Общежития (13) Гостиницы и пансионаты	(11) 1 житель в сутки	(16) $k\frac{ma\,(65-t_{х.з})}{24}=2{,}5kma$ (17)	(16) $\frac{ma\,(65-t_{х.з})}{24}=2{,}5ma$ (16)	(9) Количество людей в здании или группе зданий (12) Количество людей, проживающих в общежитии (14) Количество людей, проживающих в гостинице	(15) По СНиП II-Г. 8-62
(17) Больницы (20) Санатории и дома отдыха	(18) 1 койка в сутки			Количество коек (19)	
(21) Поликлиники и амбулатории	1 посетитель (22)		(16) $\frac{ma\,(65-t_{х.з})\,T}{kT_з}=\frac{60ma^{T}}{kt_з}$ (16)	Количество посетителей в час (23)	По табл. 7,5 (24)
(25) Душевые	1 душевая сетка в час (26)	(16) $ma\,(65-t_{х.з})=60ma$ (16)	(16) $\frac{ma\,(65-t_{х.з})\,T_{душ}}{T_з}=\frac{60ma\,T_{душ}}{T_з}$	Количество душевых сеток (27)	—
(28) Бани	1 посетитель (22)		(16) $\frac{ma\,(65-t_{х.з})\,T}{kT_з}=\frac{60ma\,T}{kt_з}$ (16)	(29) Количество посетителей бани в час, равное количеству мест в раздевальной	(24) По табл. 7.5
Прачечные	1 кг сухого белья			Производительность прачечной в кг белья в час (30)	

Key: (1). Users. (2). Unity of consumption. (3). Calculation formulas for determining the heat consumption for hot water supply. (4). maximum hours for the days of greatest water consumption $q_r^{max c}$ in kcal/h. (5). hourly mean per week $q_r^{cp.h}$, into kcal/h. (6). Quantity of ones of consumption, t. (7). Variation factor of the consumption of hot water, k. (8). Habitable houses. (9). People's quantity in building or group of buildings. (10). Hostels. (11). inhabitant in a 24 hour period. (12). Quantity of people, who live in hostel. (13). Hotels and boarding houses. (14). Quantity of people, who live in hotel. (15). On SNIP II-g.8-62. (16). that. (17). Hospitals. (18). cot in a 24 hour period. (19). Quantity of cots. (20). Sanatoriums and the houses of rest. (21). Polyclinics and dispensaries. (22). visitor. (23). Quantity of visitors in hour. (24). On table 7.5. (25). Shower-baths. (26). shower grid in hour. (27). Quantity of shower grids. (28). Baths. (29). Quantity of visitors of bath in hour, equal to a quantity of places in stripping. (30). Productivity of laundress in kg of linen in hour. (31). Boarding schools. (32). place in a 24 hour period. (33). Quantity of places³. (34). On. (35). Children's kindergartens. (36). Children per day. (37). Children's quantity in kindergartens. (38). The educational institutions. (39). studying itself into replacement. (40). Quantity of

Table 7.4 (continued).

Школы-интернаты (31)	1 место в сутки (32)	(16) $\frac{ma\,(65-t_{x.з})}{24}k=$ $=2{,}5\,kma$ (17)	(16) $\frac{ma\,(65-t_{x.з})}{24}=2{,}5ma$ (16)	Количество мест (33)	По СНиП II-Г 8-62 (24)
Детские ясли-сады (35)	1 ребенок в сутки (36)			Количество детей в ясях-садах (37)	
Учебные заведения (38)	1 учащийся в смену (39)	(17) $\frac{kma\,(65-t_{x.з})}{T}=$ $=\frac{60mak}{T}$	(16) $\frac{ma\,(65-t_{x.з})}{T_з}=\frac{60ma}{T_з}$ (16)	(40) Количество учащихся в смену	(24) По табл. 7.5
Предприятия общественного питания (41)	1 блюдо (42)	(16) $ma\,(65-t_{x.з})=60ma$ (16)	(16) $\frac{ma\,(65-t_{x.з})\,T}{kT_з}=$ $=\frac{60maT}{kT_з}$ (16)	(43) Количество реализованных блюд в час $m=22{,}2Np$, где N — количество посадочных мест; p — количество посадок в час, принимаемое: для столовых открытого типа и кафе $p=2$; для столовых при промышленных предприятиях и студенческих $p=3$; для ресторанов $p=1{,}5$	(24) По табл. 7.5
Водоразборные точки (44)	(45) 1 точка в час	(16) $ma\,(65-t_{x.з})=60ma$ (16)	(16) $\frac{ma\,(65-t_{x.з})\,T}{T_з}=$ $=60ma\,\frac{T}{T_з}$ (16)	Количество точек (46)	—
Краны умывальников (47)					—
Гаражи (48)	1 машина (49)		(16) $\frac{ma\,(65-t_{x.з})\,T}{kT_з}=$ $=\frac{60maT}{kT_з}$ (16)	Количество обслуживаемых машин (50)	По табл. 7.5 (24)

students into replacement. (41). Enterprises of public nutrition. (42). dish. (43). Quantity of realized dishes in hour 11 where N - a quantity of the setting places: p - the number of landings in hour taken; for dining rooms the open type and cafe p = 2; for dining rooms with industrial enterprises and student p = 3; for restaurants p = 1.5. (44). Water points. (45). point in hour. (46). Quantity of points. (47). Tap/cranes of wash-stands. (48). Garages. (49). machine. (50) quantity of serviced machines.

In the table are accepted the following designations: a is a norm of the consumption of hot water in 1 at temperature of 65°C, are accepted according to SNIP II-g.8-62; t - a calculated quantity of units of consumption; $t_{x.3}$ - the temperature of cold (water-conducting) water in winter period (in the absence of data is accepted $t_{x.3} = +5°C$); k - the variation factor of the consumption of hot water (by diurnal per week and hour for the days of the greatest water consumption); $T_{ayш}$ is a number of hours of the work of shower grids in a 24 hour period; $t_в$ is a number of hours of the charge of tank-storage battery/accumulators of the system of hot water supply in a 24 hour period, and for the educational institutions into

replacement. For industrial buildings is accepted the number of hours of the charge of tank-storage battery/accumulators into replacement, it is not less:

(1) при числе душевых сеток до 5	1
(2) то же, (3) от 6 до 20	2
" 21 " 30	3
(4) " 31 и более	4

Key: (1). with the number of shower grids to. (2). the same. (3). from (4). to. (5). and more.

T - the number of hours of the work of public building or enterprise in a 24 hour period, and for the educational institutions - the number of hours of work into replacement.

The notes: 1 - the simplified formulas are given at value $t_{x.s} = +5°C$.

2. In the absence of tank-storage battery/accumulators τ_s they accept $\tau_s = \tau$.

3. As for hostels.

Page 87.

During the compilation of the circuits of the heat

supply of cities or areas, and also with the plannings of main-line thermal grid/networks usually there is no enumeration of public buildings; therefore it cannot be determined heat consumption on table 7.4. In this case it is possible to determine the daily mean consumption of water by all public buildings, on the basis of the norm of the consumption of hot water by temperature 65°C, for one inhabitant in a 24 hour period in size of 20-25 l, which will compose 1200-1500 kcal/day.

Table 7.5. Values of the variation factor of the consumption of hot water for some public buildings.

(1) Потребитель	(2) Значения коэффициента неравномерности k
Поликлиники и амбулатории (3)	2
Бани (4)	2
Прачечные (5)	1.5
Детские ясли-сады (6)	4
Учебные заведения (7)	3
Предприятия общественного питания (8)	2
Гаражи (9)	1.5

Key: (1). User. (2). Values of the coefficient of nonuniformity k. (3). Polyclinics and dispensaries. [illegible]. (4). Baths. (5). Laundry. (6). Children's kindergartens. (7). The educational institutions. (8). Enterprises of public nutrition. (9). Garages.

Page 88.

Then for cities and the populated places of hourly mean heat consumption for hot water supply for the days of the greatest water consumption depending on inhabitants's total number it is possible to determine from the formula

$$Q_r^{cp} = 1{,}2\frac{m(a+b)(65-t_{x.3})}{24} = 3m(a+b) \text{ ккал/ч}, \quad (7.9)$$

(1)

Key: (1). kcal/h

a the maximum hourly consumption of heat by the formula

$$Q_r^{max} = 2Q_r^{cp} \text{ kkal ч.} \qquad (7.10)$$

Key: (1). kcal h

where a - the norm of the consumption of hot water in l with temperature of 65°C for habitable buildings for one inhabitant, taken on SNIP II-g.8-62; b - the consumption of hot water in l with temperature of 65°C for all public buildings of city or populated place for one inhabitant; it is possible to accept 20-25 l in a 24 hour period; m - inhabitants's number in year or the populated place; $t_{x.z}$ - the temperature of cold (water-conducting) water in winter period in °C (in the absence of data is accepted $t_{x.z} = +5°C$).

The total daily mean consumption of water and specific hourly mean heat consumption for hct water supply for one inhabitant depending on the character of building-up can be accepted on table 7.6 during the complete provision for population by tank, laundresses and by public nutrition.

7.3. Annual heat consumption by habitable and public buildings.

Annual heat consumption by habitable and public

buildings are determined from the formula

$$Q^{год} = Q_o^{год} + Q_в^{год} + Q_г^{год} \text{ Гкал/год}^{(1)} \quad (7.11)$$

Key: (1). Gcal/year.

where $Q_o^{год}$ is annual heat consumption for the heating of habitable and public buildings into Gcal/year; $Q_в^{год}$ is annual heat consumption for the ventilation of public buildings into Gcal/year; $Q_г^{год}$ is annual heat consumption for the hot water supply of habitable and public buildings into Gcal/year.

Annual heat consumption by habitable and public buildings according to the forms of heat consumption (heating, ventilation, hot water supply) determine from the formulas:

for the heating

$$Q_o^{год} = Q_o \frac{t_{вн} - t_{н.о}^{ср}}{t_{вн} - t_{н.о}} n_o \text{ ккал/год}^{(1)}; \quad (7.12)$$

Key: (1). kcal/year.

for the ventilation

$$Q_в^{год} = \frac{Q_в z_в}{24} \left[n_в + \frac{t_{вн} - t_{н.в}^{ср}}{t_{вн} - t_{н.в}} (n_o - n_в) \right] \text{ ккал/год}^{(1)}; \quad (7.13)$$

Key: (1). kcal/year.

to the hot water supply

$$Q_г^{год} = Q_г^{ср.ч} n_0 + 0{,}8 Q_г^{ср.ч} \frac{60 - t_{х.л}}{60 - t_{х.з}} \times \times (8400 - n_0) \text{ ккал/год. (Дж)} \quad (7.14)$$

Key: (1). kcal/year.

In these formulas: Q_0; $Q_в$ are maximum hourly consumptions of heat for heating and ventilation in kcal/h; $Q_г^{ср.ч}$ - hourly mean heat consumption for hot water supply in kcal/h; n_0 is duration of heating period in hours (see Table 1.3); $n_в$ is a number of hours in heating period with the temperatures of external air lower than calculated for designing ventilation (when $t_{н.в} = t_{н.0}$ $n_в = 0$); $z_в$ is a number of hours of operation of ventilation in the course of twenty-four hours; $t_{вн}$ is the averaged temperature of internal air of building in °C; $t_{н.0}$ is the calculated temperature of surrounding air for the planning of heating in °C; $t_{н.в}$ is the calculated temperature of surrounding air for the planning of ventilation in °C; $t_{н.0}^{ср}$ is mean temperature of surrounding air during heating period in °C; $t_{н.в}^{ср}$ - mean temperature of surrounding air in the range of heating period of calculated temperature for the planning of ventilation is above into °C; $t_{х.з}$; $t_{х.л}$ are temperature of cold (water-conducting) water in winter and summer periods; in the absence of data, accept $t_{х.з} = +5$ °C; $t_{х.л} = +15$ °C; 0.8 - the coefficient, which considers a reduction/descent in

the hourly consumption of water for hot water supply in summer period; 8400 - the number of hours of the work of the system of hot water supply per annum.

Mean temperature of surrounding air in any interval of the temperatures of heating period is defined as algebraic sum of the products of mean temperatures of surrounding air by the duration of their standing according to the formula

$$t_n^{cp} = \frac{n_1 t_{n1}^{cp} + n_2 t_{n2}^{cp} + \cdots + n_m t_{nm}^{cp}}{n_1 + n_2 + \cdots + n_m} °C. \quad (7.15)$$

where n_1, n_2, ..., n_m - the average duration of the standing of the external temperatures for the intervals through each 5°C in days or hours; $t_{n1}^{cp}, t_{n2}^{cp}, \ldots, t_{nm}^{cp}$ - mean temperatures of surrounding air for the same intervals in °C.

Values n_1, n_2, ..., n_m and $t_{n1}^{cp}, t_{n2}^{cp}, \ldots, t_{nm}^{cp}$ see Table 1.3.

Table 7.6. Total mean daily consumption of water and hourly mean heat consumption for hot water supply for habitable and public buildings for one inhabitant.

(1) Характер застройки	(2) Среднесуточный расход воды на одного жителя л/чел. сутки при температуре воды $t_г = 60°$ С	(3) Среднечасовой расход тепла на одного жителя ккал/чел. ч
Старый жилой фонд (4) . . .	125	285
Жилищное строительство последних лет (5)	135	310
Районы с малометражными квартирами (6)	145	335

Key: (1). Character of building-up. (2). mean daily consumption of water for one inhabitant l/pers day at the temperature of water. (3). Hourly mean heat consumption for one inhabitant kcal/pers•h. (4). Old housing fund. (5). Housing construction of recent years. (6). Areas with low-meterage apartments.

End section.

Chapter 8.

REGULATION OF HEAT DISTRIBUTION.

8.1. General considerations and the conventional designations.

In steam grid/networks is realize/accomplished the local regulation of heat distribution.

In water thermal grid/networks the basic regulation of heat distribution depending on the temperature of surrounding air is realize/accomplished centrally (on heat and power plant or in the boiler room), as a rule, by the following methods:

by a change in the temperature of water in delivery

pipe without the flow-rate control of water (ratio governing);

by a change in the consumption of network water at the preservation/retention/maintaining of the constant temperature of water in delivery pipe (quantitative control);

by a change in the temperature of water in delivery pipe with the appropriate change in the consumption of water (qualitative-quantitative control).

For the correction of central control in water thermal grid/networks, is carried out additionally group local control on central thermal point/items (industrial enterprises and residential sections) and on the thermal point/items of buildings, and also local individual control on separate

aggregate/units and instruments.

Below curve/graphs of the control of heat distribution in question from heat and power plant or central boiler room bear during planning auxiliary character; therefore during their construction are introduced the following simplifications:

The temperature of internal air of all heated and ventilation locations of buildings is accepted identical (for the thermal grid/networks of residential areas and common/general/total thermal grid/networks of industrial enterprises and residential areas +18°C; for the thermal grid/networks of industrial areas according to the predominant temperature in the industrial enterprises of this area, but in the absence of data +16°C);

internal heat releases in habitable and public buildings are not considered;

maximum and average/mean heat consumption for hot water supply during heating period are accepted as constants.

The presence in the separate groups of the buildings

of considerable internal heat releases or sharp deviation of internal temperature from that which was accepted during graphing of central control must be considered in the special operational curve/graphs of local control.

In the given below formulas for the calculation of the graphs of the control of heat distribution, are accepted the following principal notations:

Q_o; $Q_в$ - heat consumption for heating and ventilation in kcal/h at arbitrary temperature of surrounding air;

$Q_г$, $Q_г^{ср}$, $Q_г^{макс}$ - arbitrary, hourly mean and maximum hourly heat consumption for hot water supply in kcal/h;

$Q_г^б = Q_г^{ср} \varkappa_б$ - the "balance" hourly consumption of heat for the hot water supply by which for consecutive two-stage circuits is provided the diurnal balance of heat for heating in kcal/h;

$\varkappa = \frac{Q_г}{Q_г^{ср}}$; $\varkappa_б = \frac{Q_г^б}{Q_г^{ср}}$; $\varkappa_{макс} = \frac{Q_г^{макс}}{Q_г^{ср}}$ - arbitrary, the "balance" and maximum factors of the load of hot water supply (value $\varkappa_{макс}$ is equal to the coefficient of hour nonuniformity of the load of hot water supply $K_ч$);

$\rho = \frac{Q_г}{Q_о'}$, $\rho_{ср} = \frac{Q_г^{ср}}{Q_о'}$; $\rho_б = \frac{Q_г^б}{Q_о'}$ and $\rho_м = \frac{Q_г^{макс}}{Q_о'}$ - the ratio of arbitrary, hourly mean, "balance" and maximum hourly consumption of heat for hot water supply to calculated heat consumption for heating;

$Q_I, Q_I^{ср}, Q_I^б, Q_I^{макс}$ - productivity of step/stage I of two-stage preheaters of hot water supply with arbitrary, hourly mean, "balance" and maximum the hourly consumptions of heat in kcal/h;

$\theta = \frac{Q_I}{Q_г}$; $\theta_{ср} = \frac{Q_I^{ср}}{Q_г^{ср}}$; $\theta_б = \frac{Q_I^б}{Q_г^б}$; $\theta_м = \frac{Q_I^{макс}}{Q_г^{макс}}$ - the productivity of the step/stage of I preheaters with arbitrary, average/mean, "balance" and maximum the hourly consumptions of heat in portions of the common/general/total productivity of both step/stages of preheaters with these same heat consumptions;

$G_о, G_в$ - consumption of water for heating and ventilation in kg/h at the arbitrary temperature of surrounding air;

$G_г, G_г^{ср}, G_г^{макс}$ - arbitrary, hourly mean and maximum the hourly consumptions of network water for hot water supply with closed thermal grid/networks in kg/h.

Page 90.

$G, G_{ср}, G_{б}, G_{макс}$ - arbitrary, hourly mean, "balance" and maximum hour the common/general/total (to heating and hot water supply) consumption of network water in kg/h;

$\varphi = \frac{G}{G_o'}, \varphi_{ср} = \frac{G_{ср}}{G_o'}, \varphi_{б} = \frac{G_{б}}{G_o'}, \varphi_{м} = \frac{G_{макс}}{G_o'}$ - the ratio of the arbitrary, average/mean, "balance" and maximum of the common/general/total consumption of network water to the calculated consumption of water for heating in kg/h;

$G_{г.м}, G_{г.м}^{ср}, G_{г.м}^{макс}$ - arbitrary, hourly mean and maximum the hourly consumptions of the water, which enters the local system of hot water supply, in kg/h,

$G_{1г}, G_{2г}$ - the quantities of water, take/selected from feeding and return lines of the open thermal grid/networks to hot water supply, in kg/h;

$t_в$ - the calculated temperature of internal air in °C;

$t_н$ - the arbitrary (flowing) temperature of surrounding

air in °C for which are determined the temperatures and the consumption of water;

$t_{H.O}$ - the calculated temperature of surrounding air for the planning of heating in °C;

$t_{H.B}$ - the calculated temperature of surrounding air for design of ventilation in °C;

t_H'' - the temperature of surrounding air in salient point of the graph of the temperatures of water (see Fig. 8.5) in °C,

τ_1 - the temperature of water in the delivery pipe of thermal grid/network in °C;

$\tau_{1O}, \tau_{1O.6}, \tau_{1Om}$ - temperatures of water in the delivery pipe before the elevator (or the mixing pump) in °C with arbitrary, "balance" and maximum the hourly consumptions of heat on hot water supply in the case of two-stage series circuit (for the corrected graphs τ_{e1} - the temperature of water in delivery pipe on the heating graph),

τ_c - temperature of water in the delivery pipe of

local heating systems after mixing in °C;

τ_{2o} - the temperature of water in return line of local heating systems in °C;

$\tau_{2o.6}, \tau_{2o.м}$ -the same, with "balance" and maximum the hourly consumptions of heat for hot water supply in the case of two-stage series circuit;

$\tau_{2в}$ - temperature of water in return line of local ventilation systems in °C;

$\tau_{2г}$- the temperature of water in return line of the preheaters of hot water supply in the case of the parallel circuit of their inclusion in °C;

$\tau_2, \tau_{2cp}, \tau_{26}, \tau_{2м}$ — temperatures of water in common/general/total hourly mean, "balance" and maximum the hourly consumptions of heat for hot water supply in °C;

$\tau_{ср} = 0,5(\tau_1 + \tau_{2o})$ - mean temperature of the heaters of heating systems in °C;

$\tau_н = 0,5(\tau_1 + \tau_{2н})$ - mean temperature of the surface of heating

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

4 OF 8
ADA
066413



heaters in °C;

$t_г$ - the temperature of the hot water, which enters the local system of hot water supply, in °C;

$t_х$ - temperature of the cold water, which enters the local system of hot water supply in closed systems, in °C;

$t_п$ - the temperature of local water after step/stage I of two-stage preheater of hot water supply in °C at arbitrary heat consumption for hot water supply;

$\Delta''_б; \Delta''_м$ - a difference in the temperatures of network and local water at the end of step/stage I of two-stage preheater of hot water supply (counting on the course of local water) at "balance" and maximum the hourly consumptions of heat at salient point of temperature graph $t''_м$ into °C;

$k_о, k_з, k_г$ - the coefficients of the heat transfer of the heaters of the heating systems, heaters and preheaters of hot water supply in kcal/m² h °C;

α - a mixing factor;

n-the duration of the work of heating systems in the course of twenty-four hours in hr/day.

The given above heat consumption Q, the flow rates of the network water G, of ratio θ and ϕ, the temperatures of water in feeding and return lines of thermal grid/network and in local systems, mean temperatures and the coefficients of the heat transfer of the heaters of the heating systems, heaters and preheaters of hot water supply for the arbitrary (current) temperature of surrounding air t_H are designated without additional indices.

The same values at the calculated temperature of surrounding air for the planning of heating $t_{H.O}$ designate with one prime ', with temperature of surrounding air for the planning of ventilation $t_{H.O}$ with two primes " and at the temperature of surrounding air t'''_H in salient point of graph - with three primes '''.

8.2. Control of heat distribution for heating.

The trimmed/steading-state itself thermal condition of heating systems with all methods of continuous control is determined:

$$\overline{Q}_o = \frac{t_в - t_н}{t_в - t_{н.о}} = \frac{Q_o(\tau_1 - \tau_{2o})}{Q'_o(\tau'_1 - \tau'_{2o})} = \frac{k_o(\tau_{пр} - t_в)}{k'_o(\tau_{пр} - t'_в)}, \quad (8.1)$$

where $\overline{Q}_o = Q_o/Q'_o$ - relative heat consumption for heating.

All values with prime ' are related to the calculated temperature of surrounding air for the planning of heating $t_{н.о}$.

Central ratio governing.

The central ratio governing of heat distribution upon heating, as a rule, is accepted as basis in the two-funnelled water thermal grid/networks where the basic form of load is a heating.

In water heating systems the coefficient of the heat transfer of heaters usually is determined from the expression

$$k_o = c_o(\tau_{пр} - t_в)^{0.25},$$

where $c_в$ is the constant coefficient.

Page 91.

In this case the temperatures of water in the delivery pipe of thermal grid/network $\tau_{1в}$ after the heating systems $\tau_{2в}$ and in the delivery pipe of local heating systems $t_с$ are determined from the formulas:

$$\tau_1 = t_в + (\tau'_{1р} - t_в)\bar{Q}^{0,8} + (\tau'_1 - \tau'_{1р})\bar{Q}, \quad (8.2)$$

$$\tau_{2в} = \tau_1 - (\tau'_1 - \tau'_{2в})\bar{Q}, \quad (8.3)$$

$$\tau_с = \tau_1 - (\tau'_1 - \tau'_с)\bar{Q}. \quad (8.4)$$

The relative load of heating $\bar{Q}_в$ at the arbitrarily taken temperature of surrounding air $t_н$ is determined from the first equation of formula (8.1).

Consumption of network water at the arbitrary temperature of surrounding air is found by formula [1]

$$G_в = \frac{Q_в}{\tau_1 - \tau_{2в}}. \quad (8.5)$$

FOOTNOTE [1]. Heat capacity of water c = 1 kcal/kg deg.
ENDFOOTNOTE.

This consumption of network water at all temperatures of surrounding air remains constant and equal to the calculated consumption $G_o = G'_o$.

Values τ_1 τ_c and τ_{20} for $t_o = 18°C$ and $\tau'_c - \tau'_{20} = 25°C$ are given in Table 8.1 and in Fig. 8.1.

Tables 8.1. Temperatures of water at the ratio governing of heat distribution to water heating systems.

$Q_o = \frac{Q_o}{Q_o}$	(1) Температуры воды при τ_1						(2) Температура воды τ_{20} в °С
	$\tau_1 = \tau_1 =$ =95°С	τ_1=110°С	τ_1=120°С	τ_1=130°С	τ_1=140°С	τ_1=150°С	
0.2	39.3	41.3	43.3	45.3	47.3	49.3	33.3
0.4	54	68	64	68	72	76	44
0.6	68.5	77.6	83.5	89.5	95.6	101.5	53.5
0.8	82	94	102	110	118	126	62
1	95	110	120	130	140	150	70

Key: (1). Temperatures of water τ_1. (2). Temperature of water τ_{20} in °C.

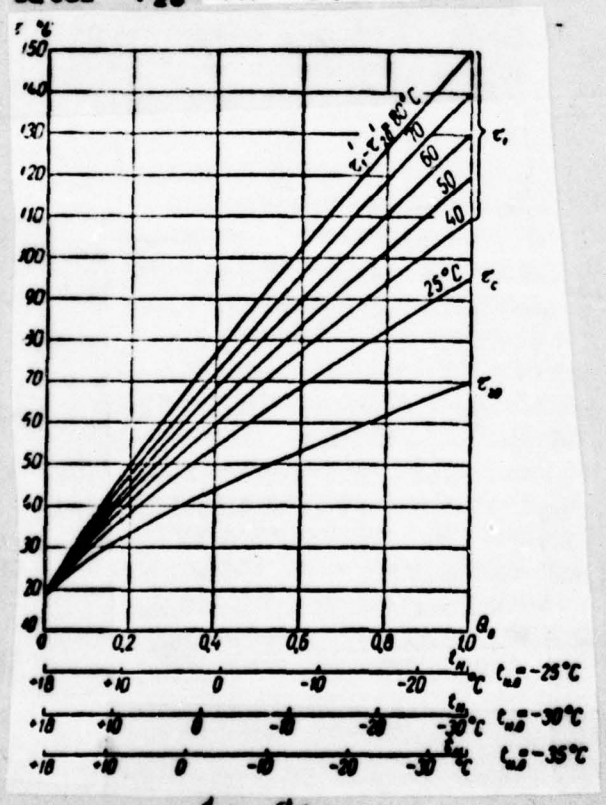


Fig. 8.1.

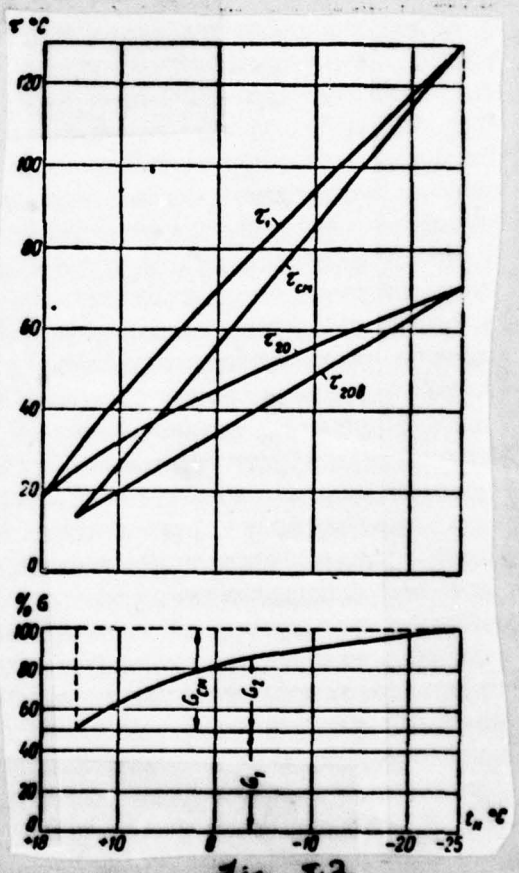


Fig. 8.2.

Fig. 8.1. Heating graph of temperatures of water at ratio governing.

Fig. 8.2. Heating curve/graphs of temperatures and consumption of water at central ratio governing of water systems and local ratio governing of air heating systems. $\tau_1, \tau_{1.m}$ - temperature of water in the feeding lines of heat and power plant and after mixing pumping; $\tau_{2.}, \tau_{2.m}$ the temperature of water after water and air heating systems; G_1, G_2 - the consumption of network water on heat and power plant for water and air heating systems; G_{cm} is consumption of the mixed water after mixing pumping.

Page 92.

For convenience in the use of graph on its axle/axis of abscissas besides $\bar{Q}_o$ are additionally constructed the temperature scales of surrounding air for several calculated temperatures $t_{H.o}$.

During the connection of the systems of hot-water heating with the aid of the water-to-water preheater the temperatures of network water after preheater are determined from formula (8.3), moreover the calculated temperature of this water is accepted upon 10°C higher than during elevator connection.

In air heating systems ($\frac{k_o}{k'_o} = 1$) the formula for determining the temperature of water in delivery pipe (usually with local control) will take the form:

$$\tau_1 = t_в + (\tau'_1 - t_в)\bar{Q}_o. \quad (8.6)$$

As an example Fig. 8.2 gives the graphs of temperatures and consumption of water at the central ratio governing of water systems and the local ratio governing of the air heating systems of some industrial buildings with the reduced temperature of internal air. In the case in question air heating systems are separated into independent line from mixing pumping. Heat consumption by water and pneumatic systems are accepted equal.

Central qualitative-quantitative control.

The central qualitative-quantitative control of heat distribution into heating is applied along with central ratio governing in thermal grid/networks purely heating load in the well adjusted heating systems [1] [40, 61].

FOOTNOTE [1]. Central qualitative-quantitative control can be

applied in the two-funnelled open thermal grid/networks with heat input to heating and hot water supply in the increased hydraulic stability of grid/network and the low sense of heat consumption for hot water supply and heating. ENDFOOTNOTE.

In the case of the temperature of water in question in the delivery pipe of thermal grid/network τ_1, in the delivery pipe of heating systems τ_c and in return line of heating systems τ_{2c} are determined from the formulas:

$$\tau_1 = t_s + (\tau'_{np} - t_s) Q_o^{0.8} + (\tau'_1 - \tau'_{np}) Q_o^{1-m}; \quad (8.7)$$

$$\tau_{2o} = t_s + (\tau'_{np} - t_s) Q_o^{0.8} - 0.5 (\tau'_c - \tau'_{2o}) Q_o^{1-m} \quad (8.8)$$

$$\tau_c = \frac{\tau_1 + \tau_{2o} u}{1 + u}, \quad (8.9)$$

where u - calculated correction factor;

n - auxiliary value.

Table 8.2. Temperatures and the consumption of water at qualitative-quantitative control.

$\bar{Q}=\frac{Q_0}{Q_0'}$	(1) Температуры воды τ_1						(2) Температура воды τ_{20} в °C	(3) Относительный расход воды $\bar{G}_0=\frac{G_0}{G_0'}$
	$\tau_1'=\tau_c'=95$°C	$\tau_1'=110$° C	$\tau_1'=120$° C	$\tau_1'=130$° C	$\tau_1'=140$° C	$\tau_1'=150$°C		
0.2	40	45.3	48.4	51.8	55.1	58.5	31.4	0.585
0.4	55.6	63.6	68.7	74.2	79.5	84.8	42.4	0.735
0.6	69.7	80.3	87.4	94.5	101.7	108.7	51.9	0.842
0.8	82.7	95.8	104.4	113	121.7	130.4	61.3	0.928
1	95	110	120	130	140	150	70	1

Key: (1). Temperature of water τ_1. (2). Temperature of water τ_{20} in °C. (3). Relative consumption of water.

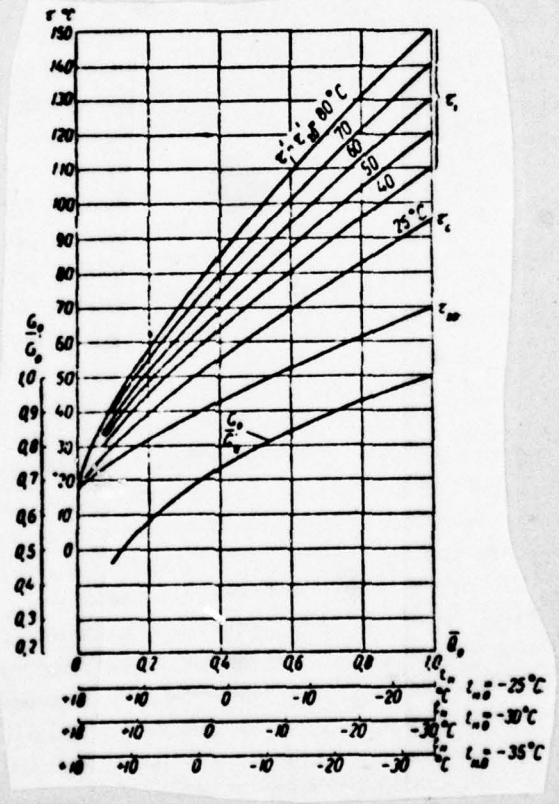


Fig. 8.3. Heating curve/graphs of temperatures and consumption of water at qualitative-quantitative control $t_в = 18$° C; $\tau_c' = 95$° C; $\tau_{2n}' = 70$° C and m = 0.33.

The consumption of network water for heating G_o is found by formula (8.5); relative consumption is equal to

$$\bar{G}_o = \frac{G_o}{G'_o} = \bar{Q}_o \frac{\tau_1 - \tau'_{20}}{\tau_1 - \tau_{20}}. \qquad (8.10)$$

The values of quantities $\tau_1, \tau_c, \tau_{20}$ and $\bar{G}_o$ for the qualitative-quantitative control of heat distribution in the case only of heating load of thermal grid/network when $t_b = 18^\circ C$, $\tau'_c = \tau'_{20} = 25^\circ$ and $n = 0.33$ are given in Table 8.2 and in Fig. 8.3.

One of the modifications of the qualitative-quantitative control is stepped control. With this control entire heating period they divide into several ranges, moreover the consumption of water changes with jump during transfer/transition from one K-band another. For the range of the low temperatures of surrounding air, is accepted the maximum consumption of the network water G'_o, for s-bands higher external temperature, the consumption of the network

water G_0 accept those who were lowered in accordance with the graph of the qualitative-quantitative control (See Fig. 8.3).

The temperatures of network water in feeding and return lines for each range calculate according to the formulas:

$$\tau_1 = t_в + (\tau'_{нр} - t_в)\bar{Q}_0^{0,8} + (\tau'_1 - \tau'_{нр})\frac{\bar{Q}_0}{\bar{G}_0}; \quad (8.11)$$

$$\tau_{20} = \tau_1 - (\tau'_1 - \tau'_{20})\frac{\bar{Q}_0}{\bar{G}_0}. \quad (8.12)$$

The temperature of water in the delivery pipe of heating system τ_e is determined from formula (8.9).

Figures 8.4 gives the graphs of temperatures and consumption of water at the stepped control of heat distribution for heating.

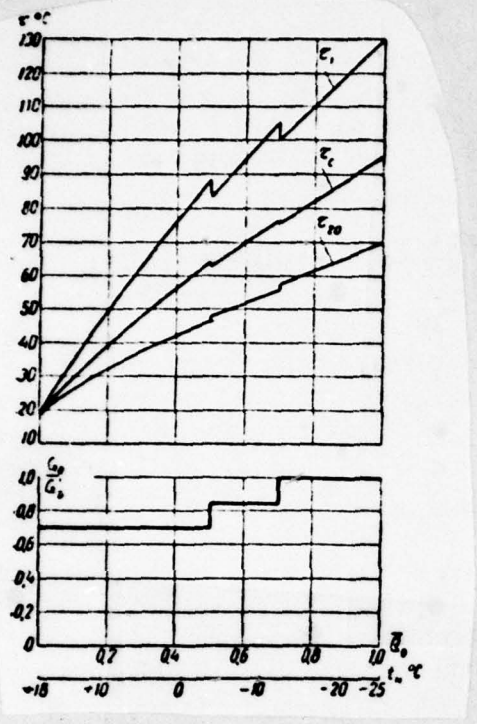


Fig. 8.4.

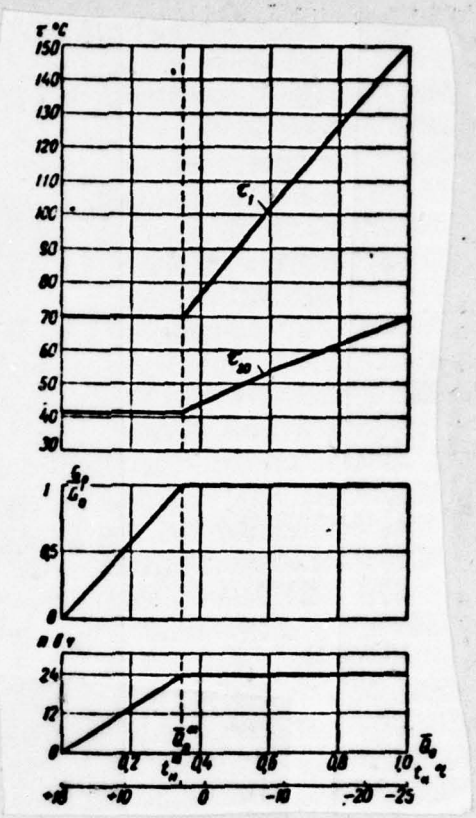


Fig. 8.5.

Fig. 8.4. Heating curve/graphs of temperatures and consumption of water at stepped control

$t_в = 18°$ C; $t_{н.о} = -25°$ C; $\tau_1' = 130°$ C;

$\tau_c' = 95°$ C; $\tau_{2в}' = 70°$ C

Fig. 8.5. Heating curve/graphs of temperatures, consumption of water and diurnal duration of work of grid/network at hit governing in warm period

$t_в = 18°$ C; $t_{н.о} = -25°$ C; $t_н'' = +3°$ C;

$\tau_1' = 150°$ C; $\tau_{2в}' = 70°$ C

Control of passages.

The control of heat distribution for heating by local passages is applied in two-funnelled water thermal grid/networks in the period of high external to the temperature of water in feed line fpr heat distribution to hot water supply.

The duration of the work of heating systems in the course of twenty-four hours when $t_н > t''_н$ is equal to

$$n = 24 \frac{t_в - t_н}{t_в - t''_н} \text{ to hr/day.} \qquad (8.13)$$

Hourly mean the consumption of water in grid/network is equal to

$$G_в = G''_в \frac{n}{24} = G''_в \frac{t_в - t_н}{t_в - t''_н}. \qquad (8.14)$$

Figures 8.5 examines the case of the control of heat distribution for the heating when in the period of the low temperatures of surrounding air provided for ratio governing, and at the high temperatures of surrounding air $\left(t_н > t''^{нр}_н\right)$ control by local passages with the constant temperature of water $\tau_1 = \tau''_1$.

Quantitative control.

The quantitative control of heat distribution into heating sometimes is applied in two-funnelled water thermal grid/networks with heat input to heating and hot water supply at the high temperatures of surrounding air ($t_H > t_H^{''}$). In this case the temperature of water in delivery pipe they support with constant and equal by minimally necessary for the work of the systems of hot water supply.

The temperature of water after water heating systems at quantitative control is determined for external temperatures $t_H > t_H^{''}$ according to the formula

$$\tau_{20} = \tau_1^{''} - \frac{1+u}{0,5+u}\left[\tau_1^{''} - t_в - (\tau_{np}^{''} - t_в) \times \right.$$
$$\left. \times \left(\frac{t_в - t_H}{t_в - t_H^{''}}\right)^{0,} \right| > t_в. \qquad (8.15)$$

the consumption of network water according to formula (8.5).

Here all values with primes ''' are related to the temperature of surrounding air $t_H^{''}$ (see Fig. 8.5).

8.3. Control of heat distribution for ventilation.

The thermal condition of the ventilation systems, connected to water thermal grid/networks, for the arbitrary temperature of surrounding air, is determined by the following equations:

$$\bar{Q}_в = \frac{m(t_в - t_н)}{m''(t_в - t_{н.в})} = \frac{V_к(t_в - t_к)}{V''_к(t_в - t'_к)} = \frac{G_в(\tau_1 - \tau_{2в})}{G''_в(\tau'_1 - \tau'_{2в})} = \frac{k_в(\tau_к - t_{ср.в})}{k''_в \cdot (\tau'_к - t'_{ср.в})}, \quad (8.16)$$

where $\bar{Q}_в = \frac{Q_в}{Q''_в}$ - is relative heat consumption for ventilation;

$V_к, V''_к$ - air flow rate through heaters at the temperatures of surrounding air of arbitrary $t_н$ and calculated $t_{н.в}$ in $м^3/ч$;

m, m'' - a multiplicity of ventilation at the temperatures of surrounding air $t_н$ and $t_{н.в}$ in 1/h;

$t_к, t''_к$ - temperature of the air before heaters at the temperatures of surrounding air $t_н$ and $t_{н.в}$ (if the recirculation of air it is absent, then $t_к = t_н$);

$t_{cp.в} = 0,5(t_в + t_в)$ and $t'_{cp.в} = 0,5(t_{н.в} + t_в)$ - mean temperature of air in heater at temperatures $t_н$ and $t_{н.в}$.

All values with primes ' are related to the calculated temperature of surrounding air for the planning of ventilation $t_{н.в}$. During the calculation of the graphs of temperatures and consumption of water the coefficient of the heat transfer of ventilation heaters $k_в$ usually is determined from the approximation formula

$$k_в = c_в w^{0,15} (v\gamma)^{0,8},$$

where w is the average speed of water in heater in m/s;

v - the average air speed in heater in m/s;

γ is an average specific gravity/weight of air in heater in kg/m³;

$c_в$ - constant coefficient.

For two-funnelled water thermal grid/networks with heat input to heating, ventilation and hot water supply the temperature of water in delivery pipe τ_1 accepts according to heating graph (see Fig. 8.1) with $t_{н.} < t'_н$ and constant ($\tau_1 = \tau^{н}_1$) when $t_н > t^{н}_н$.

Graphing of the temperatures of water in return line of ventilation systems is conducted separately for each of three temperature ranges of surrounding air, into which they divide/mark off heating period.

The temperature of water in return line of ventilation systems $\tau_{2в}$ at the arbitrary temperature of surrounding air $t_н$ is determined to the base of the following equations:

for the range of the variable temperature of water in delivery pipe and alternating/variable heat consumption for ventilation $(t''_н \geq t_н \geq t_{н.в})$

$$\tau_{2в} = \tau_1 - (\tau''_1 - \tau''_{2в})\frac{t_в - t_н}{t_в - t_{н.в}}; \qquad (8.17)$$

for the range of the constant temperature of water in delivery pipe $(\tau_1 = \tau''_1)$ and alternating/variable heat consumption for ventilation $(10°C \geq t_н \geq t'''_н)$ at the quantitative control of heat distribution for ventilation [1] (consumption of surrounding air is accepted by constant)

$$\frac{0{,}5(\tau_1+\tau_{2в}) - t_{ср.в}}{\tau''_1 - t''_{ср.в}}\left(\frac{\tau''_1 - \tau''_{2в}}{\tau_1 - \tau_{2в}}\right)^{0{,}15} = \left(\frac{t_в - t_н}{t_в - t''_н}\right)^{0{,}85}; \qquad (8.18)$$

FOOTNOTE 1. Is assumed automatic control. ENDFOOTNOTE.

for the range of the variable temperature of water in delivery pipe and constant heat consumption for ventilation ($t_н \leqslant t_{н.б}$) at control by a change in the quantity of water and at cpnstant flow rate of the air through heaters (because of a change in the recirculation) a

$$\frac{0{,}5(\tau_1+\tau_{2в})-t_{ср.в}}{\tau_к^{\circ}-t_{ср.в}^{\circ}}\left(\frac{\tau_1^{\circ}-\tau_{2в}^{\circ}}{\tau_1-\tau_{2в}}\right)^{0{,}15}=1. \quad (8.19)$$

FOOTNOTE 2. Smooth change of the flow rate of external and recirculating air with manual control they usually replace stopped. ENDFOOTNOTE.

The consumption of water for ventilation in all cases is determined from the formula

$$G_в=\frac{Q_в}{\tau_1-\tau_{1в}}. \quad (8.20)$$

Equations (8.18) and (8.19) are solved by

trial-and-error method or graphically.

Figures 8.6 gives the graph of temperatures and consumption of water for ventilation systems at two-funnelled thermal grid/networks with heat input to heating, ventilation and hot water supply.

For two-funnelled thermal grid/networks with heat input to heating and ventilation, drops off the s-band the constant temperature of water in delivery pipe.

8.4. Control of heat distribution to hot water supply.

In two-funnelled closed water thermal grid/networks with the parallel connection of the preheaters of hot water supply, the thermal condition of the latter at the arbitrary temperature of surrounding air and with constant heat consumption Q_r (maximum hour Q_r^{max} or hourly mean Q_r^{cp}) is determined by the following equations:

$$\frac{Q_r(\tau_1-\tau_{2r})}{Q_r^{\circ}(\tau_r^{\circ}-\tau_{2r}^{\circ})}=\frac{k_r\Delta t}{k_r^{\circ}\Delta t^{\circ}}=1. \qquad (8.21)$$

where Δt - thermal head in preheater.

In the given equations all values with primes ''' pertain to the temperature of surrounding air $t_н'''$ to which corresponds salient point of temperature graph, also, for which the value τ_1''' and τ_{1r}''' assigned/prescribed.

During the calculation of the graphs of temperatures and consumption of water the coefficient of the heat transfer of preheater usually is determined from the approximation formula

$$k_r = c_r \sqrt{G_r G_{r.m}},$$

where G_r and $G_{r.m}$ are consumption of network and local water in preheater, and c_r is constant coefficient.

For two-funnelled closed water thermal grid/networks with heat input to heating and hot water supply the temperature of water in delivery pipe is accepted according to heating graph with $t_н < t_н'''$ and the constant $\tau_1 = \tau_1'''$ when $t_н > t_н'''$. In this case the determination of the temperature of network water after the preheaters of hot water supply at the arbitrary temperature of surrounding air and at constant heat consumption (maximum hour or hourly mean) is produced as follows:

for the range of the constant temperature of water in

delivery pipe ($10°C \geq t_н \geq t'''_н$) value τ_{2r} accepts constant and equal to the temperature of water after preheaters at the temperature of surrounding air $t'''_н$ i.e. $\tau_{2r} = \tau'''_{2r}$;

for the range of alternating/variable temperature of water in the feeding line ($t''_н \geq t_н \geq t_{н.о}$) value τ_{2r} finds by trial-and-error method from the equation

$$\frac{(\tau_1 - t_r) - (\tau_{2r} - t_x)}{2{,}3\,\Delta t''' \lg \frac{\tau_1 - t_r}{\tau_{2r} - t_x}} \sqrt{\frac{\overline{\tau_1'' - \tau_{2r}''}}{\tau_1 - \tau_{2r}}} = 1, \qquad (8.22)$$

where

$$\Delta t''' = \frac{(\tau_1'' - t_r) - (\tau_{2r}'' - t_x)}{2{,}3 \lg \frac{\tau_1'' - t_r}{\tau_{2r}'' - t_x}}.$$

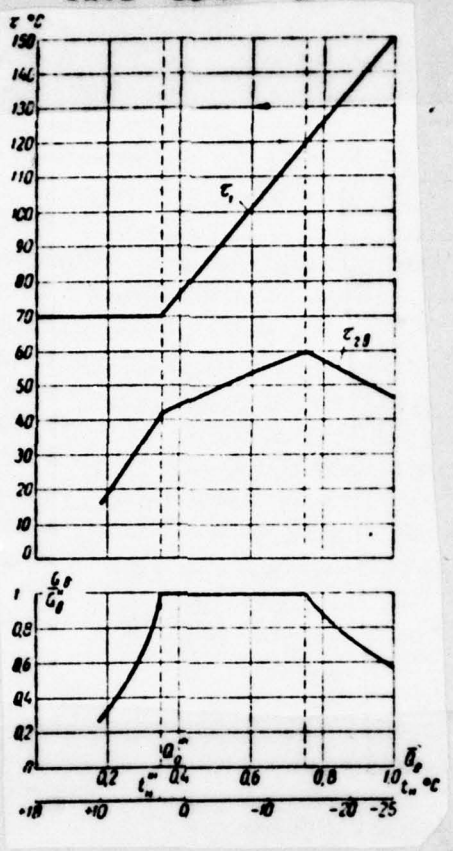


Fig. 8.6. Graphs of temperatures and consumption of water for ventilations in two pipe heating systems.

$t_в = 16°$ C; $t_{н.о} = -25°$ C; $t_{н.в} = -14°$ C.
$t''_н = +3°$ C; $\tau'_1 = 150°$ C

Page 96.

Instead of equation (8.22) with the permissible degree of accuracy with $\tau_в > 85°$C it is possible to use the approximation formula

$$\tau_{2r} = \sqrt{\frac{p^2}{4} + r} - \frac{p}{2}, \qquad (8.23)$$

where

$$p = \frac{2,36(\Delta t'')^2}{\tau''_1 - \tau''_{2r}} + 1,06(\tau_1 - t_i) - 2t_н;$$

$$r = \frac{2,36(\Delta t'')^2 \tau_1}{\tau''_1 - \tau''_{2r}} - [0,539(\tau_1 - t_i) - t_н]^2.$$

the obtained on the basis of equations (8.22) or (8.23) temperatures of water after the preheaters of hot water supply remain one and the same both for maximum hour and for hourly mean heat consumption for hot water supply (Fig. 8.7).

The consumption of network water for hot water supply in the parallel connection of preheaters is determined from the formula

$$G_r = \frac{Q_r}{\tau_1 - \tau_{2r}}. \quad (8.24)$$

Substituting in the last/latter formula of hourly mean (Q_r^{cp}) either maximum hour $(Q_r^{макс})$ heat consumption for hot water supply, we will respectively obtain hourly mean (G_r^{cp}) or maximum hour $(G_r^{макс})$ the consumption of network water.

For a two-funnelled closed thermal grid/network with heat input to heating and hot water supply Fig. 8.7 gives the graphs of temperatures and relative consumption of network water for hot water supply at the coefficient of hour nonuniformity

$$K_4 = \alpha_{макс} = 2.$$

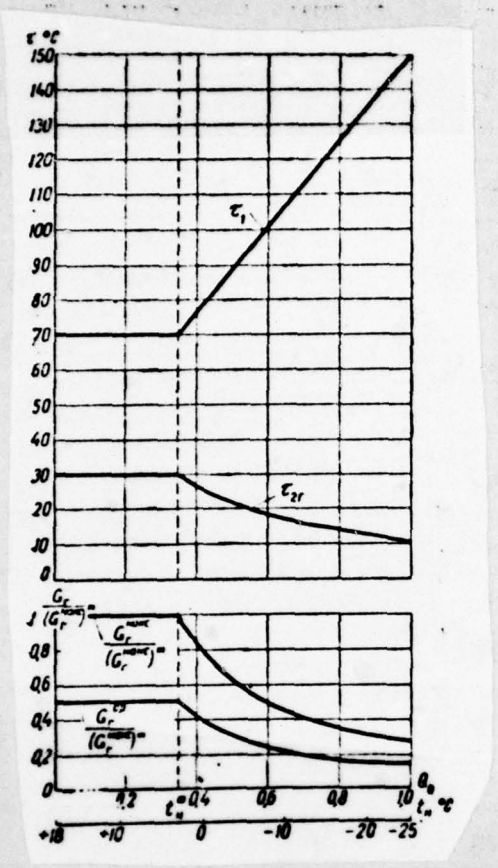


Fig. 8.7.

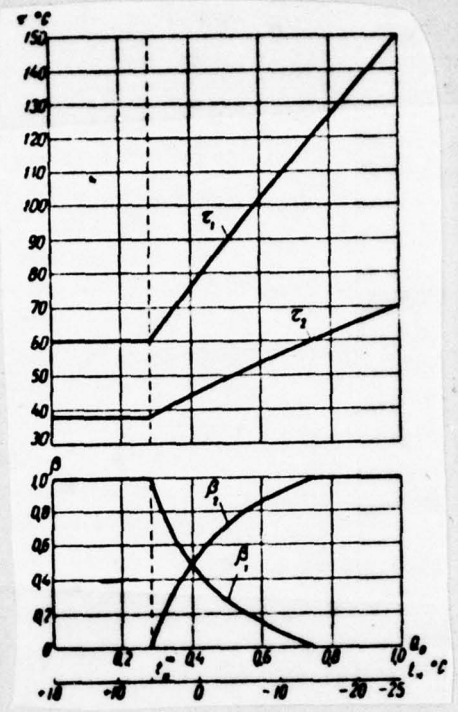


Fig. 8.8.

Fig. 8.7. Graphs of temperatures and consumption of water for hot water supply at two-funnelled closed thermal grid/networks and the parallel connection of the preheaters of the hot water supply

$\tau_1^{\circ} = 70^{\circ}$ C; $\tau_{2r}^{\circ} = 30^{\circ}$ C; $t_x = 5^{\circ}$ C; $t_r = 60^{\circ}$ C; $\alpha_{max} = 2$.

Fig. 8.8. Graphs of temperatures and consumption of water for hot water supply at two tube open thermal grid/networks

$\beta_1 = \frac{G_{1r}}{G_{r\cdot M}}$; $\beta_2 = \frac{G_{2r}}{G_{r\cdot M}}$; $\tau_1^{\circ} = t_r = 60^{\circ}$ C.

Page 97.

The relative consumption of water $\frac{G_r}{G_r^{макс}}$ are given for the maximum hour $(Q_r^{макс})$ and hourly mean $(Q_r^{ср})$ of heat consumption.

For the two-funnelled open thermal grid/networks the portion of the consumption of water for hot water supply from feeding and return lines with arbitrary heat consumption (maximum hour and mean hourly) is determined from the formulas:

$$\beta_1 = \frac{G_{1r}}{G_r} = \frac{\tau - \tau_2}{\tau_1 - \tau_2}; \quad (8.25)$$

$$\beta_2 = 1 - \beta_1 = \frac{G_{2r}}{G_r}. \quad (8.26)$$

where G_{1r} - G_{2r} - the consumption of water for hot water

supply from feeding and return lines;

$G_r = G_{1r} + G_{2r}$ - the total consumption of water for hot water supply;

β_1 and β_2 - the portion of the consumption of water for hot water supply (with respect to the total consumption of water for hot water supply) from feeding and return lines;

τ_1, τ_2 and τ - the temperature of water in the feeding and opposite lines and the mixture, which enters the system of hot water supply.

Figures 8.8 gives the graphs of the relative consumption of water for hot water supply β_1 and β_2 for the two-funnelled open thermal grid/network, working at the low ($t_H < t_H'''$) temperatures of surrounding air on heating graph with ratio governing ($\tau_1' = 150°C$), and at the high ($t_H > t_H'''$) temperatures of surrounding air with the temperature of water $\tau_1 = \tau_1''' = 60°C$.

8.5. Control of heat distribution in the two-stage

connections of the preheaters of hot water supply.

The two-stage connections of the preheaters of hot water supply are given in Fig. 8.9.

In the two-stage mixed connection of the preheater of hot water supply (Fig. 8.9a) the thermal condition of the work of heating system does not depend on the conditions/mode of the work of hot water supply.

In two-stage series circuit of the connection/inclusion of the preheater of hot water supply (Fig. 8.9b) the thermal conditions of the work of heating system and preheater closely interconnected.

If thermal grid/network has several groups of users with the different connections of preheaters, then the calculations of the graphs of control $\tau_2 = f(t_н)$ and $G = f(t_н)$ conduct at first for each group separately, and then for a thermal grid/network as a whole.

CONTROL IN THE MIXED TWO-STAGE CIRCUIT OF CONNECTION OF THE PREHEATERS OF HOT WATER SUPPLY.

The mixed connection of the preheaters of hot water supply is applied in the two-funnelled closed thermal grid/networks of the populated places independent of the value of the relation of the loads of hot water supply and heating in users. In these grid/networks the temperature of water in feed line $\tau_1 = \tau_{10}$ when $t_н < t_н'''$ ($t_н'''$ - corresponds to salient point of temperature graph) it changes on heating graph, and when $t_н > t_н'''$ it is supported by constant.

The consumption of water for heating G_0 and the temperature of water after the heating systems τ_{20} are determined by common methods for purely heating load.

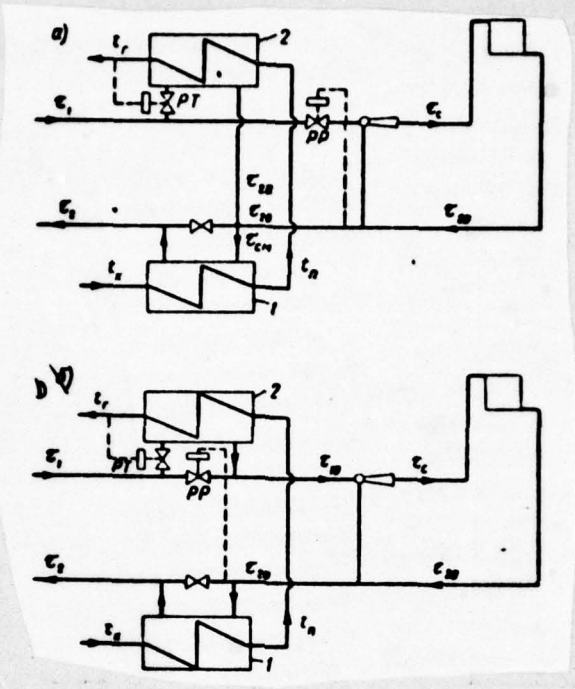


Fig. 8.9. Two-stage connections of preheaters of hot water supply a) mixed; b) consecutive; 1 - step/stage of I preheater; 2 - step/stage of II preheater; RR - flow regulator of water; RT - temperature regulator of local water.

Page 98.

At the arbitrary temperature of surrounding air $t_н$ and arbitrary heat consumption $Q_т$ (usually maximum hour $Q_т^{макс}$ or

hourly mean $Q_r^{ср}$) the consumption of water for hot water supply G_r and total G, the ratio of the total consumption of network water to the calculated consumption of water for heating φ, the temperatures of network water on leaving from the step/stage of II preheaters τ_{2II} and at the stage inlet of I preheaters $\tau_{см}$ the temperature of water in common/general/total return line (taking into account heating and hot water supply) τ_2 and the temperature of local water on leaving from the step/stage of I preheaters $\tau_{пI}$ is determined from the following formulas:

$$G_r = \frac{Q_r(1-\theta)}{\tau_1 - \tau_{2II}}; \quad (8.27)$$

$$G = G_o' + G_r; \quad (8.28)$$

$$\varphi = \frac{G}{G_o'} = 1 + \frac{(\tau_1' - \tau_{2o}')(1-\theta)\rho}{\tau_1 - \tau_{2II}}; \quad (8.29)$$

$$\frac{G_r}{G_{r.м}} = \frac{(t_r - t_x)(\varphi - 1)}{(\tau_1' - \tau_{2o}')\rho}; \quad (8.30)$$

$$\frac{G_{r.м}}{G} = \frac{(\tau_1' - \tau_{2o}')\rho}{(t_r - t_x)\varphi}; \quad (8.30a)$$

$$\tau_{см} = \frac{\tau_{2o} + \tau_{2II}(\varphi - 1)}{\varphi}; \quad (8.31)$$

$$\tau_2 = \tau_{см} - \frac{Q_r\theta}{G} = \tau_{см} - (\tau_1' - \tau_{2o}')\frac{\theta\rho}{\varphi}; \quad (8.32)$$

$$t_п = t_x + (t_1 - t_x)\theta. \quad (8.33)$$

where $\rho = Q_r'/Q_o'$ - the ratio of load on hot water supply to

design load on heating:

$\theta = Q_I/Q_r$ - the productivity of step/stage I in portions of the common/general/total productivity of both step/stages of preheater.

According to the given formulas are determined all values at design conditions of hot water supply, i.e., at the maximum hourly consumption of heat Q_r^{max} and the temperature of surrounding air t_H'''. For determining value θ_M''' are assigned the value Δ_M''' (usually $\Delta_M''' = 10°C$) and accept the temperature of the network water before the stage inlet of I preheaters of the equal to the temperature of water after heating systems:

$$\theta_M'' = \frac{\tau_{2.0}'' - \Delta_M'' - t_x}{t_r - t_x}. \qquad (8.34)$$

Thermal heads of step/stages I and of II preheaters during this same conditions/mode are found by the formulas:

$$\Delta t_{I\,M}'' = \frac{(\tau_{2\,M}'' - t_x) - \Delta_M''}{2{,}3 \lg \frac{\tau_{2\,M}'' - t_x}{\Delta_M''}}; \qquad (8.35)$$

$$\Delta t_{II\,M}'' = \frac{(\tau_1'' - t_r) - \Delta_M''}{2{,}3 \lg \frac{\tau_1'' - t_r}{\Delta_M''}}. \qquad (8.36)$$

At the temperatures of surrounding air, different from t_H''' and ho arbitrary load Q_r, value θ is determined by

trial-and-error method on the basis of following equations;

$$\theta = \frac{\varepsilon_1 G_{1\,мен}(\tau_{см} - t_х)}{Q_г}, \qquad (8.37)$$

where

$$\varepsilon_1 = \frac{1}{0{,}65 + 0{,}35\frac{G_{1\,мен}}{G_{1\,бол}} + \frac{1}{\Phi_1}\sqrt{\frac{G_{1\,мен}}{G_{1\,бол}}}} < 1,$$

$$\Phi_1 = \frac{\theta''_м}{\Delta t'_{1\,м}}\sqrt{\frac{(t_г - t_х)(\tau'_1 - \tau'_{2\,0})\rho_м}{\varphi''_м}}.$$

$G_{I\,мен}, G_{I\,бол}$ - is a smaller and larger value of the consumption of the transferring heat flows in step/stage I.

With

$$\frac{G_{1\,мен}}{G_{1\,бол}} = \frac{G_{г.м}}{G} < 1 \quad \frac{G_{1\,мен}}{Q_г} = \frac{1}{t_г - t_х};$$

with

$$\frac{G_{1\,мен}}{G_{1\,бол}} = \frac{G}{G_{г.м}} < 1 \quad \frac{G_{1\,мен}}{Q_г} = \frac{\varphi}{(\tau'_1 - \tau'_{2\,0})\rho}$$

$$\tau_{2\,II} = \tau_1 - (\tau_1 - t_п)\frac{\varepsilon_{II}\, G_{II\,мен}}{G_г}, \qquad (8.38)$$

where

$$\varepsilon_{II} = \frac{1}{0{,}65 + 0{,}35\frac{G_{II\,мен}}{G_{II\,бол}} + \frac{1}{\Phi_{II}}\sqrt{\frac{G_{II\,мен}}{G_{II\,бол}}}} < 1,$$

$$\Phi_{II} = \frac{1 - \theta''_м}{\Delta t''_{II\,м}}\sqrt{\frac{(t_г - t_х)(\tau'_1 - \tau'_{2\,0})\rho_м}{\varphi''_м - 1}}.$$

$G_{II\,мен}$, $G_{II\,бол}$ is a smaller and larger value of the consumption of the transferring heat flows of water in step/stage II.

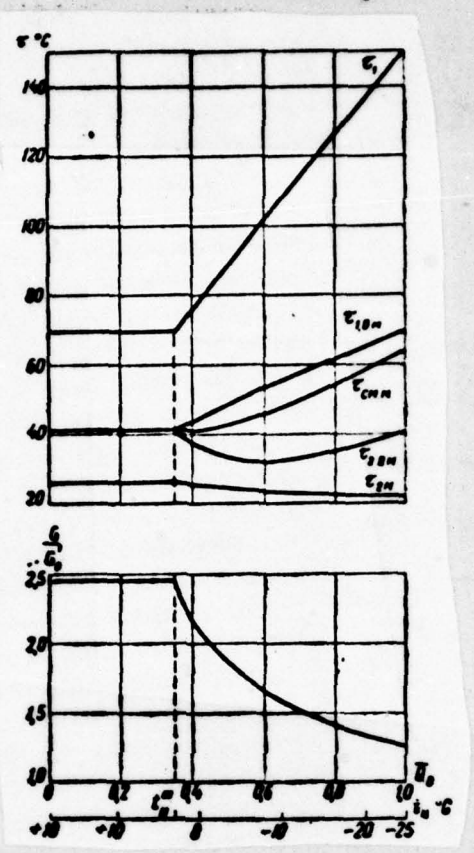


Fig. 8.10. Graphs of temperatures and common/general/total consumption of water at two-stage mixed connection of preheaters of hot water supply

$t_1^0 = 70°$ C; $t_x = 5°$ C; $t_p = 60°$ C;
$\beta_{cp} = 0.4$; $\beta_H = 1$; $\Delta_H^0 = 10°$ C.

With $\frac{G_{\text{II мен}}}{G_{\text{II бол}}} = \frac{G_r}{G_{\text{г.м}}} < 1 \quad \frac{G_{\text{II мен}}}{G_r} = 1,$

with

$$\frac{G_{\text{II мен}}}{G_{\text{II бол}}} = \frac{G_{\text{г.м}}}{G_r} < 1 \quad \frac{G_{\text{II мен}}}{G_r} = \frac{(\tau_1' - \tau_{2.0}')\rho}{(t_r' - t_x)(\varphi - 1)}.$$

Substituting in the given equations of value for maximum hour $\left(\rho_м = \frac{Q_r^{макс}}{Q_o'}\right.$ and $\left.\varphi_м\right)$ or for hourly mean $\left(\rho_{ср} = \frac{Q_r^{ср}}{Q_o'}\right.$ and $\left.\varphi_{ср}\right)$ heat consumption, we obtain respectively value $\theta_м$ for the maximum hourly consumption of heat or value $\theta_{ср}$ for hourly mean heat consumption.

Figures 8.10 gives the graphs of temperatures and common/general/total consumption of network water for heating and hot water supply (in relative values) for a two-funnelled thermal grid/network at the two-stage mixed connection of the preheaters of hot water supply.

The given on graphs data are related to the maximum hourly consumption of heat for hot water supply.

Control with the consecutive two-stage connection of the preheaters of hot water supply and heating graph for the low temperatures of surrounding air.

Series circuit of the inclusion of the preheaters of hot water supply is applied in the two-funnelled closed thermal grid/networks of the populated places for buildings with the relation of maximum heat consumption for hot water supply and heating Q_r^{max}, $Q_г' \leq 0.8$.

In this case the temperature of water in delivery pipe when $t_н < t_н'''$ changes on heating graph, and when $t_н > t_н'''$ - it is supported by constant.

The determination of the common/general/total consumption of network water for graphing is produced on the so-called "balance" heat consumption which somewhat above average heat consumption for hot water supply and by which is provided the diurnal balance of heat for heating. The value of "balance" load factor in the case of the uniform load of preheater of hot water supply in the course of twenty-four hours (for example, during the installation of storage battery/accumulators) comprises $\varkappa_г = 1$, and for the common graph of the diurnal load of habitable houses $\varkappa_г = 1.2$.

Initial data for the calculation of the graphs of

control they are the temperature of water in delivery pipe $\tau_1 = \tau_{1o}$ which is assigned/prescribed by heating graph, and also the relation of heat consumption for hot water supply and the heating

$$\rho_б = \frac{Q_r^{cp} \times_б}{Q_o'} \text{ and } \rho_м = \frac{Q_r^{макс}}{Q_o'}.$$

Here $Q_r^{cp}, Q_r^{макс}$ and Q'_o are heat consumption for hot water supply (hourly mean and maximum hour) and heating when $t_{н.о}$ for users with the two-stage subsequent circuit of connection of the preheaters of hot water supply.

For the arbitrary temperature of surrounding air $t_н \leq t_н''$ and arbitrary heat consumption for hot water supply (usually maximum hour $Q_r^{макс}$ or "balance" $Q_r^б$) a total temperature differential of network water in both step/stages of preheaters $\Delta\tau_r$, of the temperature of the water before the elevator τ_{1o} and in common/general/total return line τ_2 is determined from the formulas:

$$\Delta\tau_r = (\tau'_{1o} - \tau'_{2o})\frac{\theta}{\varphi}; \quad (8.39)$$

$$\tau_{1o} = \tau_1 - \Delta\tau_r(1-\theta); \quad (8.40)$$

$$\tau_2 = \tau_{1o} - \Delta\tau_r\theta. \quad (8.41)$$

where $\varphi = \frac{G}{G_o}$ - the ratio of the total consumption of network water to the consumption of water for heating;

$\theta = \frac{Q_1}{Q_r}$ - the productivity of step/stage I in portions of the common/general/total productivity of both step/stages of preheaters.

Graphing of temperatures and consumption of water begins with the determination of all values at "balance" heat consumption for hot water supply and at the temperature of surrounding air $t_н'''$ [92, 94 and 99]. The general productivity of the step/stage of I preheaters with "balance" heat consumption they determine, being given value $\Delta_б'''$ (usually $\Delta_б''' = 5\ °C$), according to the formula

$$\theta_б'' = \frac{\tau_{2\,о.б}'' - \Delta_б'' - t_х}{t_г - t_х}. \qquad (8.42)$$

For simplification in the calculation, accept, that the temperature of water in return line of heating systems at "balance" heat consumption and the arbitrary temperature of surrounding air $t_н \leqslant t_н'''$ is equal to the same temperature on heating graph, i.e., $\tau_{2\,о.б} = \tau_{2\,о.р}$ and $\tau_{2\,о.б}''' = \tau_{2\,о.р}'''$.

The consumption of network water in relative values at balance load $Q_r^б$ for the arbitrary temperature of surrounding air $t_н \leqslant t_н'''$ is determined from the formula

$$\gamma_б = \frac{G_б}{G_о} = 1 + \frac{Q_r^б(1-\theta_б)}{\tau_1 - \tau_{2\,о}}. \qquad (8.43)$$

Substituting in the last/latter formula of value θ''_6, τ'''_1 and $\tau''_{20.6}$ corresponding to t''_H, are determined that Φ'''_6.

Values $\Delta\tau'''_{r.6}, \tau'''_{10.6}$ and τ'''_{26} are determined from formulas (8.39), (8.40) and (8.41) with the substitution in them of values ρ_6, φ''_6 and $\tau''_{20.6} = \tau''_{20.p}$.

Thermal head for the step/stage of I preheaters with "balance" load is equal to t''_H:

$$\Delta t''_{16} = \frac{(\tau''_{26} - t_x) - \Delta''_6}{2.3 \lg \frac{\tau''_{26} - t_x}{\Delta''_6}}. \qquad (8.44)$$

The ratio of the total consumption of water to the calculated consumption of water for heating with the maximum hourly consumption of heat for hot water supply is taken as equal to:

$$\Phi_m = \Phi_6 \psi, \qquad (8.45)$$

where ψ - the coefficient, which considers an increase in the consumption of network water with the maximum hourly consumption of heat for hot water supply (for pilot-actuateds regulator $\psi = 1$ for regulators of the type $\psi = 1.1$)

Value θ at the arbitrary temperature of surrounding air $t_H \leq t'''_H$

and arbitrary heat consumption Q_r (maximum hour $Q_r^{макс}$ or "balance" $Q_r^{б}$) is determined on the basis of the following equations:

$$\theta = \frac{\varepsilon_1 G_{1\,мен}(\tau_{20} - t_н)}{Q_r}. \qquad (8.46)$$

where

$$\varepsilon_1 = \frac{1}{0{,}65 + 0{,}35\frac{G_{1\,мен}}{G_{1\,бол}} + \frac{1}{\Phi_1}\sqrt{\frac{G_{1\,мен}}{G_{1\,бол}}}};$$

$$\Phi_1 = \frac{\theta_б^{-}\sqrt{(t_г - t_н)\Delta\tau_{г.б}^{-}}}{\Delta t_{1б}^{-}};$$

$G_{1\,мен}, G_{1\,бол}$ - the smaller and larger value of the consumption of the transferring heat flows of water in step/stage I.

With $\frac{G_{1\,мен}}{G_{1\,бол}} = \frac{\Delta\tau_г}{t_г - t_н} \leq 1$ $\frac{G_{1\,мен}}{Q_г} = \frac{1}{t_г - t_н}$.

with $\frac{G_{1\,мен}}{G_{1\,бол}} = \frac{t_г - t_н}{\Delta\tau_г} \leq 1$ $\frac{G_{1\,мен}}{Q_г} = \frac{1}{\Delta\tau_г}$.

Here ρ, Φ, τ_{20}, $\Delta\tau_г$ and ε_I - they correspond to arbitrary heat consumption $Q_г$.

The temperature of water after heating systems at the arbitrary temperature of surrounding air $t_н \leq t_н^{''}$ and "balance" heat consumption for hot water supply is accepted $\tau_{10.б} = \tau_{10.р}$.

but with the maximum hourly consumption of heat they are determined from the equation

$$\tau_{2\,o.м} = \frac{\left(\tau_1 - \Delta\tau_{г.м} - e_1 \frac{G_{1\,мсн}}{G_{макс}} t_2\right)(1-e_0) + t_1 e_0}{1-(1-e_0)\, e_1 \frac{G_{1\,мсн}}{G_{макс}}}, \quad (8.47)$$

where

$$e_0 = \frac{1}{\frac{0,5+u}{1+u} + \frac{(\tau_{пр.р} - t_0)\,q_м}{\tau_{1\,о.р} - \tau_{2\,о.р}}} < 1.$$

Here values $\tau_{1\,о.р}$, $\tau_{2\,о.р}$ and $\tau_{пр.р} = \frac{\tau_c + \tau_{з\,о.р}}{2}$ are accepted according to heating graph for the examined temperature of surrounding air $t_н$.

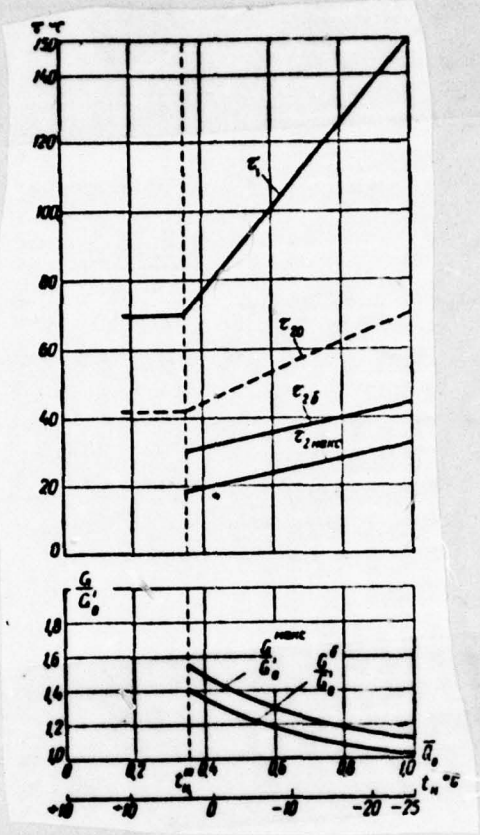


Fig. 8.11. Graphs of temperatures and common/general/total consumption of water at two-stage subsequent circuit of connection of preheater of hot water supply

$t''_1 = 70°$ C; $t_x = 5°$ C; $t_г = 60°$ C; $\rho_{ср} = 0.3$; $\rho_м = 0.08$; $\varepsilon_б = 1.2$; $\Delta''_б = 5°$ C .

With $\frac{t_г - t_х}{\Delta\tau_{г.м}} < 1$ $\frac{G_{1\,исч}}{G_{макс}} = 1$,

with $\frac{\Delta\tau_{г.м}}{t_г - t_х} < 1$ $\frac{G_{1\,исч}}{G_{макс}} = \frac{\Delta\tau_{г.м}}{t_г - t_х}$.

For the calculation of the temperatures $\tau_{10.б}$ and $\tau_{2б}$ at the "balance" heat consumption and $t_н < t'''_н$ into the formulas (8.39), (8.40), (8.41) of andes (&46) it is necessary to substitute values $\rho_б$ and $\varphi_б$. Analogously for the calculation of temperatures $\tau_{10.м}$ and $\tau_{2м}$ with the maximum hourly consumption of heat into the indicated formulas it is necessary to substitute $\rho_м$ and $\varphi_м$.

Figures 8.11 gives the graphs of the temperatures and common/general/total consumption (in relative values) at two-stage series circuit of hot water supply and the heating graph of temperatures for $t_н < t'''_н$.

Control on the increased temperature graph in the two-stage subsequent circuit of connection of the preheaters of hot water supply.

Central control on the increased temperature graph (with temperature increase to heating graph) is applied for the two-funnelled closed water thermal grid/networks of the populated places when not less than 75o/o buildings they have systems of hot water supply in essence with two-stage series circuit of the connection/inclusion of preheaters.

The calculation of the increased graph $\tau_1 = f(t_н)$ is performed with "balance" heat consumption for hot water supply. For this mode of operation of thermal grid/network the consumption of water in it and the temperature of water in the delivery pipe before the elevator are accepted according to the heating graph of the ratio governing

$$\left(\varphi_б = \frac{G_б}{G_o} = 1 \text{ and } \tau_{1\,o.б} = \tau_{1\,o.p}\right).$$

At the indicated conditions the temperature of water in delivery pipe will be equal to:

$$\tau_1 = \tau_{1\,o.p} + \Delta\tau_{г.б}(1 - \theta_б). \qquad (8.48)$$

Values $\Delta\tau_{г.б}$ and $\theta_б$ are determined from formulas (8.39) and (8.46), substituting in them $\varphi_б = 1$ and $\beta_б = \frac{Q_г^б}{Q'_o}$, where $Q_г^б$ and Q'_o are "balance" heat consumption for hot water supply

and calculated heat consumption for heating in users from two-stage with two-stage series circuit of the connection/inclusion of preheaters.

For the operating mode in question the temperature of water in common/general/total return line is determined from the formula (8.41), in which the temperature of water in return line of heating systems is accepted according to the heating graph of ratio governing $\left(\tau_{20.6} = \tau_{20.p}\right)$.

The temperatures of water at the maximum hourly consumption of heat for hot water supply $\tau_{10.m}, \tau_{20.m}$ and τ_{2m} calculate according to formulas (8.39), (8.40), (8.41), (8.46) and (8.47), when $\varphi_m = \varphi_6 \psi = \frac{G_{max}}{G_0}$ and $\rho_m = \frac{Q_{max}}{Q'_0}$.

Figures 8.12 gives the increased temperature graph in two-stage series circuit of the connection/inclusion of the preheaters of hot water supply.

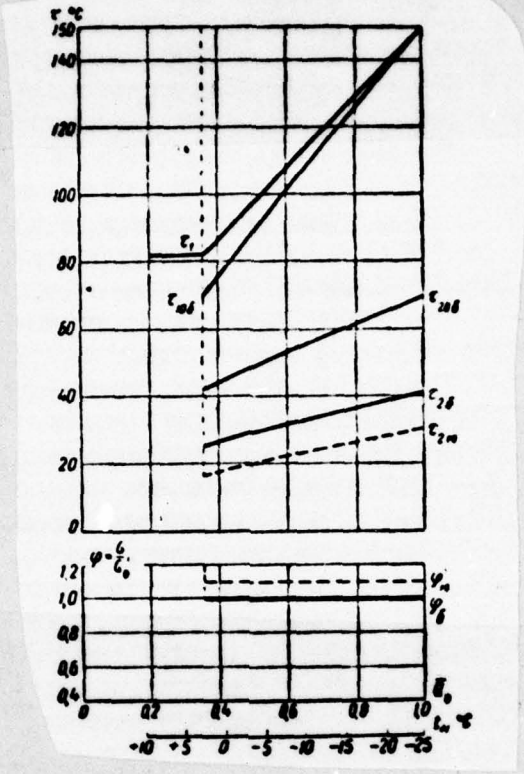


Fig. 8.12. Increased temperature graph in two-stage connection of preheaters of hot water supply

$\tau_1^{\circ} = 82^{\circ}$ C; $t_x = 5^{\circ}$ C; $t_г = 60^{\circ}$ C; $\beta_{ср} = 0.3$;

$\beta_м = 0.66$; $\varkappa_б = 1.2$; $\Delta_б^{\circ} = 5^{\circ}$ C .

8.6. Corrected curve/graphs of control for the open systems of thermal grid/networks.

Central control on the corrected curve/graphs is applied in the two-funnelled open systems of the thermal grid/networks of the populated places when of the predominant quantity of connected users the ratio of hourly mean heat consumption for hot water supply to the calculated hourly consumption of heat for heating comprises $e_{c_p} = \frac{Q_r^{cp}}{Q_o} = 0.1 - 0.3$.

Salient point of the corrected graphs is accepted at the same temperature of surrounding air, as salient point of heating graph.

When $\tau_3 \geq t_r$ the temperatures of water in thermal grid/network τ_1 and τ_2 are accepted according to the heating graph of ratio governing [24].

Contrpl with constant common/general/total flow rate/consumption of water in delivery pipe.

Control with constant common/general/total (to heating and hot water supply) flow rate/consumption of water in delivery pipe G_1, which takes as equal to the calculated consumption of water for heating G^o_o, it requires installation on the thermal point/items of the users of flow regulators on the common/general/total delivery pipe.

The calculation of the graph of control is performed with "balance" heat consumption for hot water supply $Q^б_г = Q^{ср}_г \varkappa_б$, moreover the coefficient of the "balance" load of habitable buildings without storage battery/accumulators is accepted $\varkappa_б = 1.1$.

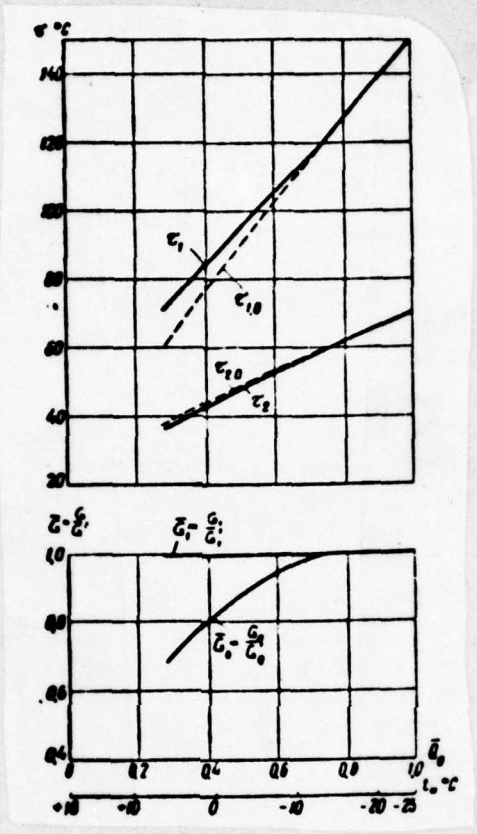


Fig. 8.13. Graphs of temperatures and consumption of water for two-funnelled open thermal grid/network with control at constant flow rate/consumption of water in common/general/total delivery pipe. τ_{10}, τ_{20} - are temperatures of water in feeding and return lines on heating graph; τ_1, τ_2 - the same, on the corrected graph; G_0 is consumption of water for heating; G_1 is common/general/total of the consumption in delivery pipe; $t_0 = 18°$ C; $\tau_1 = \tau_{10} = 150°$ C; $\tau_{20} = 70°$ C; $t_2 = 5°$ C; $t_r = 65°$ C; $P_{cp} = 0.3$; $\tau_0 = 1.1$.

The determination of the relative consumption of water for heating $\bar{G}_o = (G_o/G'_o)$ (G_o and G'_o the consumption of water for heating when t_H and $t_{H.o}$) the temperature of water in that which feeds τ_1 and in return line τ_2 at the arbitrary temperatures of surrounding air $t_H \leqslant t_H^{nl}$ are produced by formulas of Prof Ye. Ya. Sokolov:

$$\bar{G}_o = \frac{G_o}{G'_o} = \frac{1 - \frac{0,5(\tau'_c - \tau'_{2\,o})\rho_6}{t_r - t_x}}{1 + \frac{(t_r - t_n)\rho_6}{(t_r - t_x)\bar{Q}_o} - \frac{(\tau'_{np} - t_n)\rho_6}{(t_r - t_x)Q_o^{0,2}}}; \quad (8.49)$$

$$\tau_1 = t_n + (\tau'_{np} - t_n)Q_o^{0,8} + (\tau'_1 - \tau'_{np})\frac{\bar{Q}_o}{G_o}; \quad (8.50)$$

$$\tau_2 = t_n + (\tau'_{np} - t_n)\bar{Q}_o^{0,8} - 0,5(\tau'_c - \tau'_{2\,o})\frac{\bar{Q}_o}{G_o}. \quad (8.51)$$

where $\bar{Q}_o = \frac{Q_o}{Q_o}$ - relative heat consumption for heating at the arbitrary temperature of surrounding air t_H,

$\rho_{\text{б}} = \frac{Q^{\text{б}}}{Q_{\text{o}}}$ is ratio of balance heat consumption for hot water supply to calculated heat consumption for heating;

τ_1', τ_c', $\tau_{\text{хв}}'$ and $\tau_{\text{гв}}'$ are temperatures of water in the delivery pipe of thermal grid/network and in the conduit/manifolds (feeding and reverse/inverse) of heating systems and the temperature of heaters on the heating graph of ratio governing when $t_{\text{н}}'$.

A quantity of water that which is take/selected from feeding and return lines to hot water supply, determines from formulas (8.25) and (8.26).

Figures 8.13 gives the graphs of temperatures and consumption of water for the two-funnelled open thermal grid/network with control at constant flow rate/consumption of water in overall delivery pipe.

CONTROL WITH THE ALTERNATING/VARIABLE CONSUMPTION OF WATER IN FEEDING LINE AND A CONSTANT PRESSURE DIFFERENTIAL AT STATION.

With this method of control on the thermal point/items of users, is establish/installed only temperature regulator on the flow of water, which enters the system of hot water supply. During the initial control of grid/network (with switched off hot water supply) in all users are establish/installed identical complete pressures (sum piezometric head) both in feeding and return lines.

The calculation of the graph of control is performed according to hourly mean heat consumption for hot water supply $Q_r^{ср}$ by formulas of Prof. Ye. Ya. Sokolov

$$\bar{G}_0 = \sqrt{\frac{1}{S_1(1+\psi_1)^2 + S_0 + S_2(1-\psi_2)^2}}. \quad (8.52)$$

where

$$\psi_1 = \frac{\rho}{(t_r - t_x)}\left[\frac{t_r - t_x}{\bar{Q}_0} - \frac{\tau'_{np} - t_0}{\bar{Q}_0^{0.2}} + \frac{0{,}5(\tau'_1 - \tau'_{2\,0})}{(1+u)\bar{G}_0}\right];$$

$$\psi_2 = \frac{\rho}{t_r - t_x}\left[\frac{\tau'_{np} - t_0}{\bar{Q}_0^{0.2}} + \right.$$

$$\left. + \frac{(0{,}5+u)(\tau'_1 - \tau'_{2\,0})}{(1+u)\bar{G}_0} - \frac{t_r - t_x}{\bar{Q}_0}\right].$$

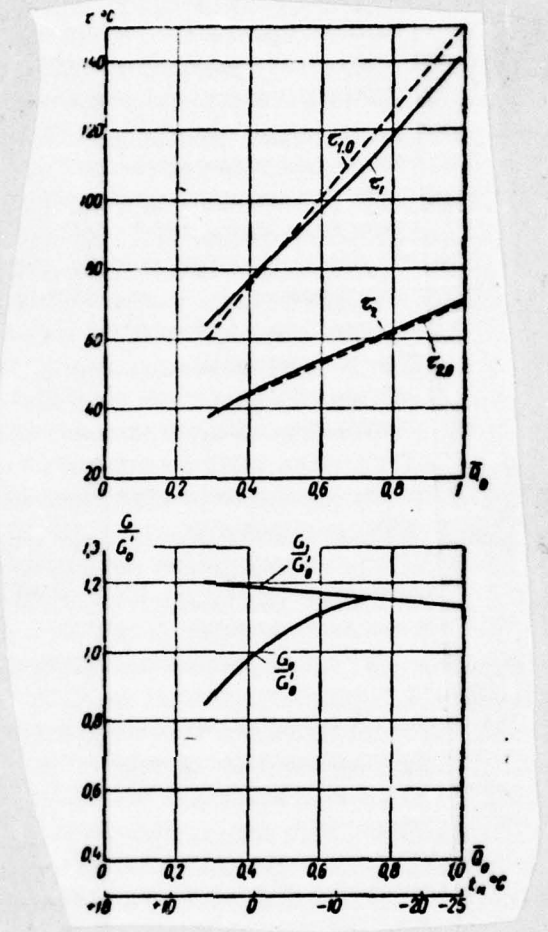


Fig. 8.14. Graphs of temperatures and consumption of water for the two-funnelled open thermal grid/network at the alteraating/variable consumption of water in the commoa/general/total delivery pipe and a constant pressure differential at station. $\tau_{1.0}$, $\tau_{2.0}$ - the temperature of water in feeding and return lines on heating graph; τ_1, τ_2 are the same, on the corrected graph; G_0 is consumption of

water for heating; G_1 is common/general/total flow rate in delivery pipe;

$t_0 = 18°$ C; $\tau'_1 = \tau'_{1o} = 150°$C; $\tau'_{2o} = 70°$ C;

$t_x = 5°$ C; $t_p = 60°$ C; $\rho_{cp} = 0.3$;

$\bar{S}_1 = \bar{S}_2 = 0.4$; $\bar{S}_3 = 0.2$.

Page 104.

The temperature of water in feeding and return lines of thermal grid/network is determined from the formulas:

$$\tau_1 = t_0 + (\tau'_1 - \tau'_{2o}) \frac{\bar{Q}_o}{G_o} \left[\frac{0.5+u}{1+u} + \frac{(\tau'_{np} - t_0) G_o}{(\tau'_1 - \tau'_{2o}) Q_o^{0.8}} \right]; \quad (8.53)$$

$$\tau_2 = t_0 + (\tau'_1 - \tau'_{2o}) \frac{\bar{Q}_o}{G_o} \left[\frac{(\tau'_{np} - t_0) G_o}{(\tau'_1 - \tau'_{2o}) Q_o^{0.8}} - \frac{0.5}{1+u} \right]. \quad (8.54)$$

In formulas (8.52), (8.53), and (8.54) is marked:

$\rho = \rho_{cp} = \frac{Q_r^{cp}}{Q_o}$ - the ratio of hourly mean heat consumption for hot water supply to calculated heat consumption for heating;

$\bar{S}_1, \bar{S}_3$ and $\bar{S}_2$ are relative resistance of delivery pipe, elevator unit and return line (during calculation by these

values are selected, taking into account that $\bar{S}_1 + \bar{S}_2 + \bar{S}_3 = 1$).

All remaining designations the same as in formulas (8.49) is (8.51).

Figures 8.14 gives the graphs of temperatures and consumption of water (in relative values) for the two-funnelled open thermal grid/networks at the alternating/variable consumption of water in the common/general/total delivery pipe and a constant pressure differential at station.

INSTALLED

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 5185618

FEBRUARY 11, 1969 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

TITLE

01 INCORPORATE EC 307100

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE	OPEN EC	INS-EXT-CON
MANUAL	307100		R	S	1176170	01	1				921	R			
CONTENTS	307100		R	S	1176171	01	1				921	R			
SYSTEM DIA	307100		R	S	1176188	01	1				921	R			
SYSTEM DIA	307100		R	S	1176189	01	1				921	R			
CHARTS	307100		R	S	1176190	01	1				921	R			
SYSTEM DIA	307100		R	S	1176191	01	1				921	R			
SIGNAL	307100		R	S	1176195	01	1				921	R			
SIGNAL	307100		R	S	1176196	01	1				921	R			
TITLE	307100		R	S	1176198	01	1				921	R			
CONTENTS	307100		R	S	1176199	01	1				921	R			
ALD	307100		R	S	1176207	01	1				921	R			

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 5185618

FEBRUARY 11, 1969 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE	OPEN	EC	INS-EXT-CON
ALD	3071CC		R	S	1176208	01	1				921	R				
ALD	3071CC		R	S	1176209	01	1				921	R				
ALD	3071CC		R	S	1176211	01	1				921	R				
ALD	3071CC		R	S	1176212	01	1				921	R				
ALD	3071CC		R	S	1176213	01	1				921	R				
ALD	3071CC		R	S	1176214	01	1				921	R				
ALD	3071CC		R	S	1176215	01	1				921	R				
ALD	3071CC		R	S	1176216	01	1				921	R				
ALD	3071CC		R	S	1176218	01	1				921	R				
ALD	3071CC		R	S	1176219	01	1				921	R				
ALD	3071CC		R	S	1176220	01	1				921	R				
ALD	3071CC		R	S	1176221	01	1				921	R				
ALD	3071CC		R	S	1176222	01	1				921	R				

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 5185618

FEBRUARY 11, 1969 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE	OPEN	EC	INS-EXT-CON
ALD	307100		R	S	1176223	01	1				921	R				
ALD	307100		R	S	1176224	01	1				921	R				
ALD	307100		R	S	1176225	01	1				921	R				
ALD	307100		R	S	1176226	01	1				921	R				
ALD	307100		R	S	1176227	01	1				921	R				
ALD	307100		R	S	1176228	01	1				921	R				
ALD	307100		R	S	1176229	01	1				921	R				
ALD	307100		R	S	1176230	01	1				921	R				
ALD	307100		R	S	1176231	01	1				921	R				
ALD	307100		R	S	1176232	01	1				921	R				
ALD	307100		R	S	1176233	01	1				921	R				
ALD	307100		R	S	1176234	01	1				921	R				
ALD	307100		R	S	1176235	01	1				921	R				

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 5185618

FEBRUARY 11, 1969 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE	OPEN	EC	INS-EXT-CON
ALD	3071CC		R	S	1176236	C1	1				921	R				
ALD	3071CC		R	S	1176237	01	1				921	R				
ALD	3071CC		R	S	1176238	01	1				921	R				
ALD	3071CC		R	S	1176239	01	1				921	R				
ALD	3071CC		R	S	1176240	01	1				921	R				
ALD	3071CC		R	S	1176241	01	1				921	R				
ALD	3071CC		R	S	1176242	01	1				921	R				
ALD	3071CC		R	S	1176243	01	1				921	R				
ALD	3071CC		R	S	1176244	01	1				921	R				
ALD	3071CC		R	S	1176245	01	1				921	R				
ALD	3071CC		R	S	1176248	01	1				921	R				
ALD	3071CC		R	S	1176249	01	1				921	R				
ALD	3071CC		R	S	1176250	01	1				921	R				

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 9185618

FEBRUARY 11, 1969 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE	OPEN	EC	INS-EXT-CON
ALD	3071CC		R	S	1176252	01	1				921	R				
INST INSN	3071CC		R	S	1186225	01	1				921	R				
ALD	3071CC		R	S	1186239	01	1				921	R				
SYSTEM DIA	3071CC		R	S	1186309	01	1				921	R				
ALDS	3071CC		R	S	1186487	01	1				921	R				
ALDS	3071CC		R	S	1186488	01	1				921	R				
ALDS	3071CC		R	S	1186489	01	1				921	R				
ALDS	3071CC		R	S	1186490	01	1				921	R				
ALDS	3071CC		R	S	1186491	01	1				921	R				
SIGNALS	3071CC		R	S	1186497	01	1				921	R				
CONN	3071CC		R	S	1186498	01	1				921	R				
ALD	3071CC		R	S	5162277	01	1				921	R				
ALD	3071CC		R	S	5162278	01	1				921	R				

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 5185618

FEBRUARY 11, 1969 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE OPEN	EC	INS-EXT-CON
ALD	3071CC		R	S	5162285	01	1				921	R			
ALD	3071CC		R	S	5162286	01	1				921	R			
ALD	3071CC		R	S	5162287	01	1				921	R			
ALD	3071CC		R	S	5162288	01	1				921	R			
ALD	3071CC		R	S	5162289	01	1				921	R			
ALD	3071CC		R	S	5162290	01	1				921	R			
ALD	3071CC		R	S	5162291	01	1				921	R			
ALD	3071CC		R	S	5162292	01	1				921	R			
ALD	3071CC		R	S	5162293	01	1				921	R			
ALD	3071CC		R	S	5162294	01	1				921	R			
BOARD DIA	3071CC		R	S	5162302	01	1				921	R			
MFI DESCR	3071CC		R	S	5162303	01	1				921	R			
LISTING	3071CC		R	S	5162304	01	1				921	R			

IBM RALEIGH MANUFACTURING BILL OF MATERIAL B/M NUMBER 5185618

FEBRUARY 11, 1965 PRODUCTION LEVEL DEPT 417,REQUESTOR-WELLS

BASIC NAME	DESCRIPTION	PL	CH	R	PART NO	UM	QTY	REF NO.	MFG 1 2 3	OPER	DEPT	MFG 4 5	FILE	OPEN	EC	INS-EXT-CON
TOC #2	307100	R		S	5162305	01	1				921	R				
TERM ID	307100	R		S	5162306	01	1				921	R				
FIELD BM	B/M	R		S	5185618	01	1				921	R				
FIELD BM	307100 INSTR	R		S	5185618	01	1				921	R				
DECAL		L		D	0813769	01	1				921	L				
FORM NO	Y27-1020	N		D	2222222	01	1				921	N				

CHANGE LEVEL

PROD 307100

PART NO. QTY NO. CDS

MFG LEVEL
ENG LEVEL

IBM INSTALLATION INSTRUCTION

PN 5185618

SHEET: 1 OF 5

ENG. CHANGE NO: 307100

DATE OF CHANGE: APR68

WRITTEN BY: R. T. J. CHECKED BY: R.S. APPROVED BY: F. A. S.

TITLE: INCORPORATE EC 307100

MACHINE AFFECTED: 2741

STATUS: FIELD USE

I: PREREQUISITE:

BM TO BE INSTALLED	ON MACHINES WITH	EC NUMBER	BM NUMBER	AND OR	FEATURE BM NO	FEATURE OR BM DESCRIOTION	CMPN/CNCR REMARKS
5185618		306762 OR 306754 OR 507567 OR REA 23-02797 OR REA 23-02951		AND WITHOUT	1277342 OR 5195429 OR 1277002	2741-002 RPQ HAND WIRED RPQ HAND WIRED	
5185618 AND CONCURRENT FB/M 5156696		306762 OR 306754 OR 507567 OR REA 23-02797 OR REA 23-02951		AND WITH	1277342	2741-002	
5185618 AND CONCURRENT FB/M 5156697		306762 OR 306754 OR 507567 OR REA 23-02797 OR REA 23-02951		AND WITH	5195429	RPQ HAND WIRED	
5185618 AND CONCURRENT F/BM 5156698		306762 OR 306754 OR 507567 OR REA 23-02797 OR REA 23-02951		AND WITH	1277002	RPQ HAND WIRED	

ENG. CHANGE NO: 307100

DATE OF CHANGE: APR68

I: PREREQUISITE: (CONTINUED)

BM TO BE INSTALLED	ON MACHINES	EC NUMBER	BM NUMBER	AND, OR	FEATURE BM NO	FEATURE OR BM DESCRIPTION	CMPN/CNCR REMARKS
5185618 AND CONCURRENT FB/M 5185619	WITHOUT AND WITH	REA 23-02797 EC 306762 OR EC 306754 OR EC 507567		AND WITH	1176608 OR 1186217 OR 1186218	LEASED LINE OR L.D. TYPE 2B MODEM	
5185618 AND CONCURRENT FB/M 5185620	WITHOUT AND WITH	REA 23-02797 EC 306762 OR EC 306754 OR EC 507567		AND WITH	1186280 OR 1186281 OR 1186282 OR 1186283 OR 1186284 OR 1186285 OR 1186286 OR 1186287	ANY SHARED LINE MODEM	

ENG. CHANGE NO: 307100

DATE OF CHANGE: APR68

II: PREPARATION:

2.1 FAMILIARIZE YOURSELF WITH THE PURPOSE AND DETAILS OF INSTALLATION OF THIS INSTALLATION INSTRUCTION.

2.2 CHECK ALL ITEMS AND COUNT PARTS LISTED ON THE BILL OF MATERIAL TO DETERMINE THAT ALL PARTS WERE RECEIVED.

III: PURPOSE:

UPDATE MACHINES TO EC 307100

IV: DESCRIPTION:

4.1 PROVIDE F.E. ALD'S FOR ALL ALD'S IN MANUAL.

4.2 REFLECT NEW SHARED LINE AND LEASED LINE MODEM CARDS.

4.3 PERFORM WIRING REWORK TO IMPROVE MACHINE RELIABILITY IN NOISY ENVIRONMENTS.

4.4 PERFORM WIRING REWORK TO ELIMINATE GLITCH ON CARD 5807364.

V: INSTALLATION TIME:

	MAN HOURS	MACHINE HOURS	SYSTEM HOURS	NO. OF C.E.
SECTION I:	0.7	0.0	0.0	1

VI: SPECIAL TOOLS AND/OR MATERIAL REQUIRED:

SLT YELLOW WIRE ADD TOOL
SLT YELLOW WIRE DELETE TOOL
SLT PRINTED WIRE DELETE TOOL

VII: SAFETY:

REMOVE ALL ELECTRICAL POWER FROM THE MACHINE AND ASSOCIATED MACHINES BEFORE INSTALLATION BEGINS.

IBM INSTALLATION INSTRUCTION

PN 5185618

SHEET: 4 OF 5

ENG. CHANGE NO: 307100

DATE OF CHANGE: APR68

VIII: DETAILS OF INSTALLATION:

8.1 REMOVE ALL PAGES FROM MANUAL EXCEPT FORM Y27-0014.

8.2 INSERT NEW PAGES ACCORDING TO B/M 5185618. INSERT FORM #Y27-1020 IN THE FRONT OF THE MANUAL NEXT TO Y27-0014. FAMILIARIZE YOURSELF WITH FORM Y27-1020 AS IT REPLACES THE TIMING AND FLOW CHART PAGES IN THE PRESENT MDM.

8.3 PERFORM THE FOLLWING REWORK ON BOARD B1, PN 1176200

8.3.1 PERFORM THE FOLLOWING YELLOW WIRE DELETION

	NET
✓F3D06 TO E4B03	AA121AL4

PERFORM THE FOLLOWING YELLOW WIRE ADDS

	NET	CHECK PIN
✓1) E5D07 TO E5B05	AA141AH4	C4B07
✓2) E4D08 TO E4B03	AA201AV4	E4B10

8.3.2 FOR 2741'S NOT AT REA 23-02951, PERFORM THE FOLLOWING REWORK. IF THE 2741 IS AT REA 23002951, GO TO STEP 8.4.

DELETE TWO PRINTED WIRES FROM PIN G3D04

✓1) G3D04 TO H5B07	CARD SIDE	NET AA031BA2
✓2) G3D04 TO F2D12	PIN SIDE	

ADD TWO WIRES	NET	CHECK PIN
✓1) H5B07 TO F2D12	AA031BA2	
✓2) G2D06 TO G3D04	AA131AV6	E2B07

8.4 CHECK THE CONTINUITY OF REWORK.

8.5 UPDATE EC LEVEL OF BOARD B1, PN 1176200, TO EC 307100 WITH LABEL, P/N 813769.

IBM INSTALLATION INSTRUCTION

PN 5185618

ENG. CHANGE NO: 307100

DATE OF CHANGE: APR68

IX: TEST PROCEDURES:

CHECK THAT TERMINAL CAN TRANSMIT AND RECEIVE PROPERLY.

X: FIELD SUPPORT PUBLICATIONS:

ISSUED ALL NEW MANUAL PAGES.

XI: PARTS DISPOSITION:

SCRAP ALL REMOVED MANUAL PAGES.

XII: FIELD UPDATING:

12.1 UPDATE MLC HISTORY LISTING.

12.2 RETURN THE B/M INSTALLATION AND QUALITY CARD TO MLC ACCORDING TO ESTABLISHED PROCEDURES.

IBM Field Engineering

Theory of Operation

Restricted Distribution

This manual is intended for internal use only and may not be used by other than IBM personnel without IBM's written permission .

Specifications contained herein are subject to change without notice. Revisions and/or supplements to this publication will be issued periodically.

Y27-0013-0

2740/2741 Communication Terminal

IBM® Field Engineering

Theory of Operation

Restricted Distribution

This manual is intended for internal use only and may not be used by other than IBM personnel without IBM's written permission.

Specifications contained herein are subject to change without notice. Revisions and/or supplements to this publication will be issued periodically.

2740/2741 Communication Terminal

PREFACE

This manual describes the theory of operation of the basic IBM 2740/2741 Communication Terminal and its special features. To use this manual, the reader must be thoroughly familiar with these publications:

1. SLT Packaging and Documentation, Form R23-2916
2. Introduction To Teleprocessing, Form Z25-2522
3. Common-Carrier Facilities For Teleprocessing, Form Z25-2529
4. 2740/2741 Communication Terminal, Operators Guide, Form A27-3001
5. IBM Line Adapters (Modems), Form 226-3003

In addition, the reader must completely understand the operation of the SELECTRIC® I/O.

The 2740/2741 Communication Terminal, FE Diagram Manual, Form Y27-0014-0 is required to follow the explanations in the Principles of Operation and Features sections of this manual.

All figures in this manual are positive logic -- that is, a positive level is required to condition ANDs, ORs, etc. Triggers and latches also require a positive level to be turned on or off.

Second Edition

This manual is a complete revision of the former manual--2740/2741 Communications Terminal, Form 229-9503-0. Practically all figures and text are changed and brought up to EC level 506395. Explanation of only the "7 by 13" terminal (late production) is included. Also the changed line names of EC 506395 are used in explanations and figures.

Significant changes or additions to the specifications contained in this publication will be reported in subsequent revisions or FE Supplements.

A form is provided at the back of this publication for reader's comments. If the form has been removed, comments may be addressed to IBM Corporation, Product Publications, Department 860, PO Box 9592, Raleigh, North Carolina 27603.

© International Business Machines Corporation 1966

LIST OF ILLUSTRATIONS

CHAPTER 1. INTRODUCTION 1-1
Figure 1-1. 2740 Communication Terminal. 1-1
Figure 1-2. 2740 Keyboard. 1-2
Figure 1-3. 2740 Terminal Configurations 1-3
Figure 1-4. 2741 Terminal Configuration. 1-4
Figure 1-5. 2741 Keyboard. 1-5
Figure 1-6. 2740 Printer Code Conversion (BCD). 1-6
Figure 1-7. 2741 Printer Code Conversion (Correspondence Head) 1-7
Figure 1-8. 2740/2741 Data Flow 1-8

CHAPTER 2. FUNCTIONAL UNITS 2-1
Figure 2-1. S-Register. 2-2
Figure 2-2. Serdes Clock. 2-4
Figure 2-3. Control Clock 2-5
Figure 2-4. 1B-Register 2-7
Figure 2-5. 2B-Register 2-8
Figure 2-6. Print Decode. 2-9
Figure 2-7. Function Decode 2-11
Figure 2-8. Operate Trigger 2-12

CHAPTER 3. PRINCIPLES OF OPERATION 3-1
Figure 3-1. Mode Triggers (Base 2740). 3-2
Figure 3-2. Transmit Flowchart. 3-3
Figure 3-3. Generate Control Characters 3-4
Figure 3-4. Transmit Text Characters 3-5
Figure 3-5. Receive Flowchart 3-7
Figure 3-6. Power-On Reset 3-9
Figure 3-7. I/O Motor Control 3-9
Figure 3-8. Keyboard Lock. 3-10
Figure 3-9. Initial Lowercase. 3-11
Figure 3-10. Incorrect Case 3-12
Figure 3-11. Serial Data Out (Transmitted Data) 3-13
Figure 3-12. Serial Data In (Received Data) 3-13
Figure 3-13. Data Set Ready 3-13
Figure 3-14. Request to Send and Originate. 3-14
Figure 3-15. Clear to Send. 3-15
Figure 3-16. Carrier. 3-16
Figure 3-17. Data Terminal Ready 3-17
Figure 3-18. 2741 with Interrupt Flowchart 3-18

CHAPTER 4. FEATURES 4-1
SECTION 1. RECORD-CHECKING (2740) 4-1
Figure 4-1. Parity and Not S8 Errors. 4-3
Figure 4-2. LRC-Register 4-4
Figure 4-3. LRC-Register Operation 4-5
Figure 4-4. LRC-Register Control 4-6
Figure 4-5. Mode Triggers, Record-Checking 4-7
Figure 4-6. Sequence of Mode Operation, Record-Checking 4-8
Figure 4-7. Restart Circuit 4-11
Figure 4-8. Record-Checking and Auto EOB Flowchart. . . 4-12
SECTION 2. AUTOMATIC EOB (2740). 4-13
Figure 4-9. Automatic EOB 4-14
SECTION 3. DIAL-UP (2740). 4-15
Figure 4-10. Dial-Up Interface (103A) 4-15
SECTION 4. TRANSMIT CONTROL (2740). 4-17
Figure 4-11. Transmit Control Flowchart 4-18
SECTION 5. STATION CONTROL (2740) 4-19
Figure 4-12. Station Control, Terminal Configuration. . . 4-19
Figure 4-13. Addressing and Polling Character Sequence. . 4-19
Figure 4-14. Addressing, Mode Sequence 4-20
Figure 4-15. Polling, Mode Sequence. 4-21
Figure 4-16. Garble and Time-Out 15. 4-21
Figure 4-17. Station Control Flowchart 4-23
SECTION 7. INTERRUPT (2741) 4-27
Figure 4-18. Interrupt. 4-27
SECTION 8. TYPAMATIC (2741). 4-28
Figure 4-19. Typamatic Data Flow 4-28

CHAPTER 5. POWER SUPPLIES AND CONTROL 5-1
Figure 5-1. Power Supply 5-1

CHAPTER 6. CONSOLE AND MAINTENANCE FEATURES . 6-1
Figure 6-1. CE Aid Box 6-1
Figure 6-2. Single Cycle 6-2
Figure 6-3. Space Generator Flowchart 6-3
Figure 6-4. Space Generator. 6-3
Figure 6-5. Check Loop Data Flow 6-4
Figure 6-6. Check Loop. 6-5

CONTENTS

CHAPTER 1. INTRODUCTION 1-1
2740 Communication Terminal 1-1
Special Features (2740) 1-3
Record-Checking 1-3
Automatic EOB 1-3
Dial-Up 1-4
Transmit Control 1-4
Station Control 1-4
IBM 2741 Communication Terminal 1-4
Special Features (2741) 1-5
Dial-Up 1-5
Interrupt 1-5
Typamatic 1-5
Data Representation 1-5
Character Format 1-7
Data Flow 1-8

CHAPTER 2. FUNCTIONAL UNITS 2-1
S-Register 2-1
Serialization (Sending) 2-1
Deserialization (Receiving) 2-1
Serdes Clock 2-3
Control Clock 2-5
1B-Register 2-6
2B-Register 2-8
Print Decode 2-8
Function Decode 2-10
Operate Trigger (Operation in Process) 2-10

CHAPTER 3. PRINCIPLES OF OPERATION 3-1
2740 COMMUNICATION TERMINAL 3-1
Basic-Terminal Mode Control 3-1
Transmit (Point-to-Point) 3-1
Load Control Characters into 1B-Register 3-4
Load Text Characters into 1B-Register 3-5
Transfer Characters from 1B-Register to S-Register . . . 3-5
S-Register to 'Serial Data Out' Line 3-6
End-of-Transmission 3-6
Receive (Point-to-Point) 3-6
Receive Bid Character Ⓓ 3-6
Receive Text Characters 3-8
Receive End-of-Transmission Character Ⓒ 3-8
2B Overflow Reset 3-8
Power-On Reset 3-9
I/O Motor Control 3-9
Keyboard Lock 3-9
Initial Lowercase 3-11
Incorrect Case 3-12
Terminal to Line-Adapter Interface 3-12
Signal Ground-AB 3-13
Transmitted Data (Serial Data Out)-BA 3-13
Received Data (Serial Data In)-BB 3-13
Data Set Ready-CC 3-13
Request to Send-CA 3-14
Clear to Send-CB 3-14
Carrier-CF 3-17
Originate (used only for 103 F data set)-CY 3-17
Data Terminal Ready (used only for 103A data set)-CD . 3-17
2741 COMMUNICATION TERMINAL 3-17

CHAPTER 4. FEATURES 4-1
SECTION 1. RECORD-CHECKING (2740) 4-1
Introduction 4-1
Vertical Redundancy Check (VRC) 4-1
Longitudinal Redundancy Check (LRC) 4-1
End-of-Block (EOB) 4-1
Data Flow 4-1
Functional Units 4-2
Parity Error (VRC) 4-2
LRC-Register 4-5
Mode Triggers 4-6
Principles of Operation 4-8
Transmit EOB-Character 4-8
Transmit LRC-Character 4-9
Receive EOB-Character 4-9
Receive LRC-Character 4-9
Transmit-Check/Answerback 4-10
Receive-Check/Answerback 4-10
Restart 4-11
SECTION 2. AUTOMATIC EOB (2740) 4-13
SECTION 3. DIAL-UP (2740) 4-15
Dial-Disconnect 4-16
SECTION 4. TRANSMIT CONTROL (2740) 4-17
SECTION 5. STATION CONTROL (2740) 4-19
Introduction 4-19
Addressing Mode Sequence 4-20
Polling-Mode Sequence 4-20
Functional Units 4-21
Garble 4-21
Time-Out 15 4-22
Principles of Operation 4-22
Addressing 4-22
Transmit-Status/Answerback 4-22
Polling 4-24
Transmit-Poll/Answerback 4-24
SECTION 6. DIAL-UP (2741) 4-26
SECTION 7. INTERRUPT (2741) 4-27
SECTION 8. TYPAMATIC (2741) 4-28

CHAPTER 5. POWER SUPPLIES AND CONTROL 5-1

CHAPTER 6. CONSOLE AND MAINTENANCE FEATURES . 6-1
CE Aid Box 6-1
Single Cycle 6-1
Space Generator 6-3
Check Loop 6-4

APPENDIX A. MACHINE CHARACTERISTICS A-1

APPENDIX B. SPECIAL CIRCUITS B-1

INDEX X-1

Attn	Attention	MPLX	Multiplexer
BCD	Binary Coded Decimal	O	Operate
Ck	Check	SC	Station Control
COMM	Communicate	SLT	Solid Logic Technology
CR	Carrier-Return	S-Register	Shift Register
EOB	End-Of-Block	Tab	Tabulate
EOS	End-Of-State	TC	Transmit Control
EOT	End-Of-Transmission	TERM	Terminal
I	Integrator	TOM	Typamatic
IB	Inhibit Interrupt	TT	Transmit Text
I/O	Input/Output	UC	Uppercase
LC	Lowercase	VRC	Vertical Redundancy Check
LOC	Local	1B-Register	First Buffer Register
LRC	Longitudinal Redundancy Check	1CH	One Cycle Halt
Modem	Modulator-Demodulator	2B-Register	Second Buffer Register

2740 COMMUNICATION TERMINAL

- Communicates with other terminals or a computer.
- All SELECTRIC typewriter functions are retained.
- Can be used off-line as a SELECTRIC typewriter.
- Can be connected point-to-point or multipoint.
- Requires a line adapter (common-carrier data set or IBM modem).

The IBM 2740 Communication Terminal (Figure 1-1) is a device that enables data to be exchanged almost instantly between points far removed from each other. An operator can send (transmit) or receive information in typewritten form as it is needed. The exchange of information can be with another terminal or, via a multiplexer, with a computer. When connected to a computer, the terminal can enter information into the computer, request information from the computer (remote inquiry), or have problems that occur in one area solved by a computer that is located in another area.



Figure 1-1. 2740 Communication Terminal

The 2740 is designed for simplicity of operation. All controls are located on the SELECTRIC keyboard (Figure 1-2). Standard SELECTRIC keys perform the same operations for the terminal as for a standard SELECTRIC typewriter (except repetitive functions).

In addition to the standard SELECTRIC keys, the 2740 terminal has a group of keys to the left of the keyboard and a group of keys and lights to the right of the keyboard. (Note that not all of the keys to the left of the terminal keyboard are presently used.) The added keys allow the 2740 to perform the additional operations required for communications. The lights show the status of the 2740 when in communicate mode. When the terminal is not needed for communications, a Local/Communicate switch allows the SELECTRIC typewriter to be used off-line. Complete operating instructions for the terminal are in the Operators Guide, Form A27-3001, and are not covered in this manual.

Terminals can be connected to a communication system in one of two configurations: point-to-point or multipoint. Point-to-point configuration is the connection of a terminal to another terminal or to a multiplexer by a single communication line (Figure 1-3). Multipoint configuration is the connection of more than two terminals together on a single communication line (Figure 1-3). If multipoint configuration is used without the station-control special feature, all terminals on the line receive the message from any terminal in use. Only one terminal can send at a time.

The 2740 terminal uses solid logic technology (SLT), permitting the terminal logic to be contained in one compact enclosure.

Information can be exchanged over short distances (room-to-room, building-to-building) or over long distances (state-to-state, coast-to-coast). Terminals cannot be directly connected to each other. To connect a terminal to another terminal or multiplexer, a line adapter is needed. The line adapter can be either a common-carrier data set or an IBM modem (modulator-demodulator). The 2740 can communicate over privately owned lines or over common-carrier lines. When privately owned lines are used, an IBM modem connects the terminal to the line. When common-carrier lines are used, either an IBM modem or a common-carrier data set can be used. The Western Electric 103A and 103F data sets are examples of data sets that can be used.

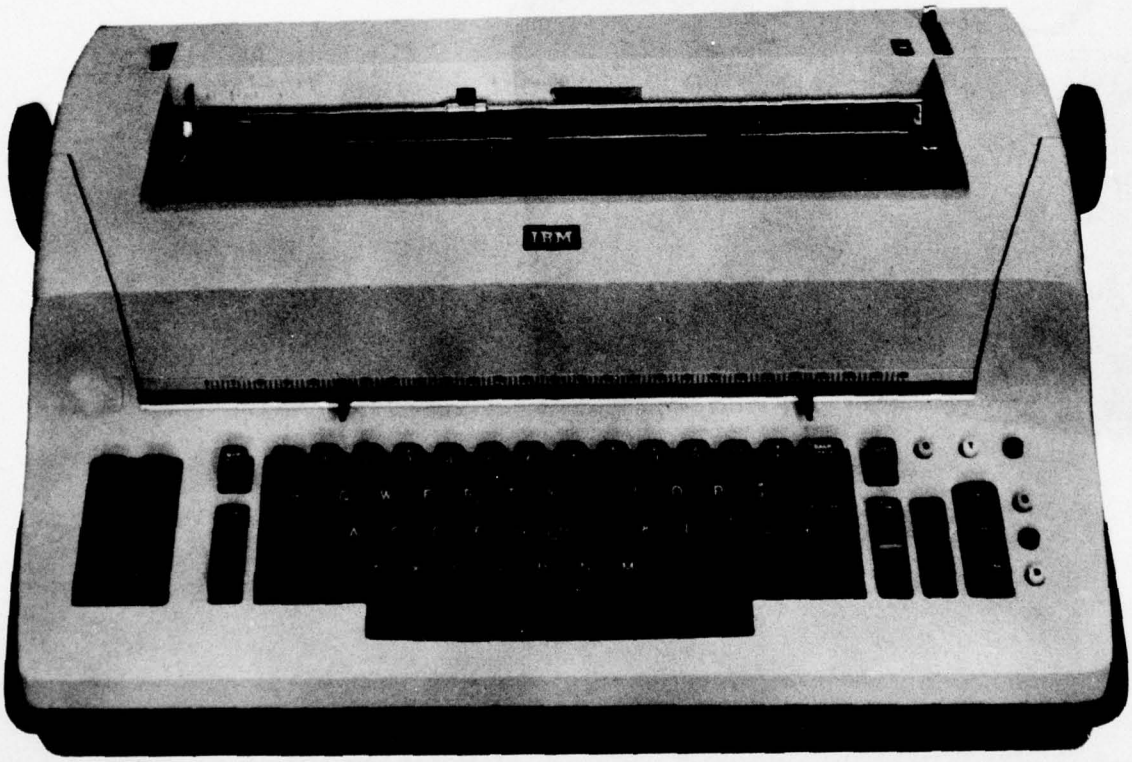


Figure 1-2. 2740 Keyboard

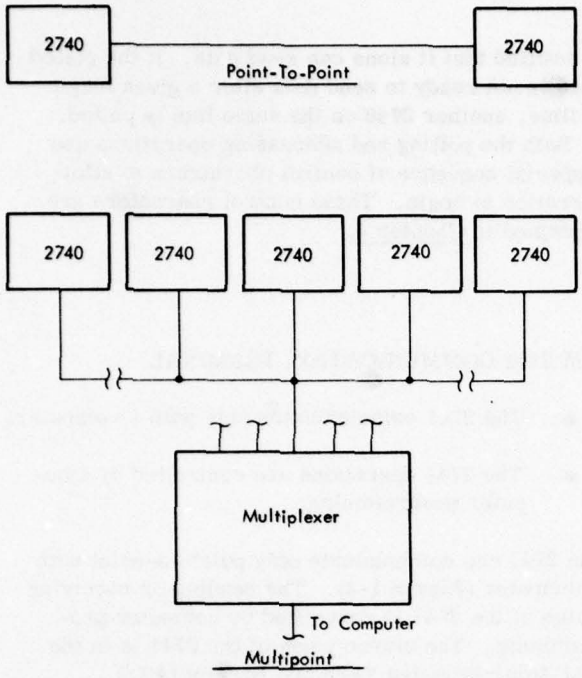


Figure 1-3. 2740 Terminal Configurations

The following paragraphs describe the basic operation of the terminal.

When a terminal is turned on (power up), the terminal goes into control-receive mode. Control-receive mode enables the terminal to accept and act on control characters. The control characters for basic-machine operation (no special features) are the bid character Ⓓ and the end-of-transmission (EOT) character Ⓒ . The Ⓓ character places the sending terminal into transmit mode and the receiving terminal into receive mode. The Ⓒ character returns both terminals to control-receive mode.

When an operator sends a message, he presses the Bid key on the terminal keyboard. This causes the terminal logic to go into transmit mode and to generate and send the Ⓓ character. The Ⓓ character is received at the other terminal, which then goes into receive mode. The operator at the sending terminal keys in the message exactly as he would on a standard typewriter. When the message is completed, the operator presses the EOT key at the sending terminal. This causes a Ⓒ character to be generated and sent, and returns the sending terminal to control-receive mode. The Ⓒ character is received at the receiving terminal and returns the terminal to control-receive mode. Either terminal can now "bid" for the line and start sending information.

SPECIAL FEATURES (2740)

Many special features are available for the 2740. These features allow the 2740 to be used with a dial-telephone system, or allow more than one 2740 to be used on a single communication line. With the record-checking feature, the 2740 can check and verify all incoming data.

Record-Checking

- VRC checks each character.
- LRC checks blocks of data.
- Data is checked in the receiving terminals.

With this feature, the 2740 checks all data it receives for validity. (This feature is not available for the 2741.) Data is checked in two ways: vertical redundancy check (VRC) and longitudinal redundancy check (LRC). VRC checks each character for odd-bit parity; LRC checks the entire message to insure that all characters were sent and received. In LRC checking, a special check character is generated by both the sending and receiving 2740's.

During the sending operation, the operator periodically presses the EOB key on the sending 2740.

This causes the generated LRC check character to be sent over the line to the receiving 2740. The receiving 2740 then compares the check character it receives with the one it has generated. If an error is detected, the Restart light turns on, indicating to the operator that an error has occurred.

When a VRC-error occurs, a dash is printed in place of the error character and the message continues. When an LRC-error is detected, a dash is printed, the Restart light comes on, and the terminal keyboard locks until the Restart key is pressed.

Automatic EOB

- Checks data each time the Carrier-Return key is pressed.

The automatic EOB feature causes data to be checked every time the Carrier-Return key is pressed on the sending 2740. Thus, each print line is checked and, in the event of an error, can be resent as soon as the error is detected.

Dial-Up

- Connects a 2740 to another 2740 or to a computer by using a dial-telephone data set.

The dial-up feature allows the 2740 to communicate, via the common-carrier dial network, with another 2740 or with a computer. The entire telephone common-carrier system is available for use by the terminals. This feature reduces common-carrier communication costs to a minimum; a charge is made for the line only during the time the terminal is actually connected to the line. This feature is used with the Western Electric 103A dial data set or equivalent. The operator dials a telephone number to connect the terminal to another terminal equipped with the same feature.

Transmit Control

- Allows the computer to control the sending or receiving status of the terminal.

The dial-up feature is a prerequisite for this feature. The transmit-control feature allows the computer to control the sending or receiving status of a remote terminal. Thus, the 2740 with this feature is under complete control of the computer. (This feature is not needed for the 2741.)

Station Control

- Allows more than one 2740 to be on the same communication line without contention.
- A single 2740, a group of 2740's or all 2740's on the line can be addressed to receive data.
- Each 2740 on the line is separately polled to send data.

The station-control feature allows more than one 2740 to be connected to a single communication line without contention (more than one terminal attempting to transmit at the same time). (This feature is not available for the 2741.) The communication line can be either a private in-house line or a leased common-carrier line. A special system of addressing and polling allows a computer to control the send or receive status of each terminal on the communication line.

Addressing is an operation by which the computer calls a terminal to send data to it. Each 2740, a pre-determined group of 2740's, or every 2740 on the line can be addressed to receive the message through the use of special addressing codes.

Polling is an operation by which a particular 2740 is notified that it alone can send data. If the polled 2740 is not ready to send data after a given length of time, another 2740 on the same line is polled.

Both the polling and addressing operations use a special sequence of control characters to allow operation to begin. These control characters are explained in Chapter 4.

IBM 2741 COMMUNICATION TERMINAL

- The 2741 communicates only with a computer.
- The 2741 operations are controlled by computer programming.

The 2741 can communicate only point-to-point with a computer (Figure 1-4). The sending or receiving status of the 2741 is controlled by computer programming. The primary use of the 2741 is in the IBM Administrative Terminal System (ATS).

The 2741 uses most of the same sending and receiving circuits as the 2740 and communicates by means of a data set or modem. The main physical difference between the 2741 and the 2740 is the SELECTRIC keyboard. On the 2741, no keys or lights are added to the standard SELECTRIC keyboard, but the Index key is replaced with the Attention key (Figure 1-5). Another difference is that all special features available for the 2740 are not available for the 2741. The standard 2741 uses a

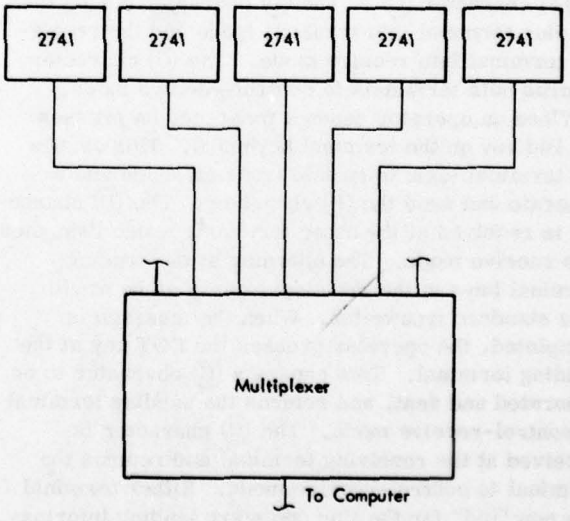


Figure 1-4. 2741 Terminal Configuration

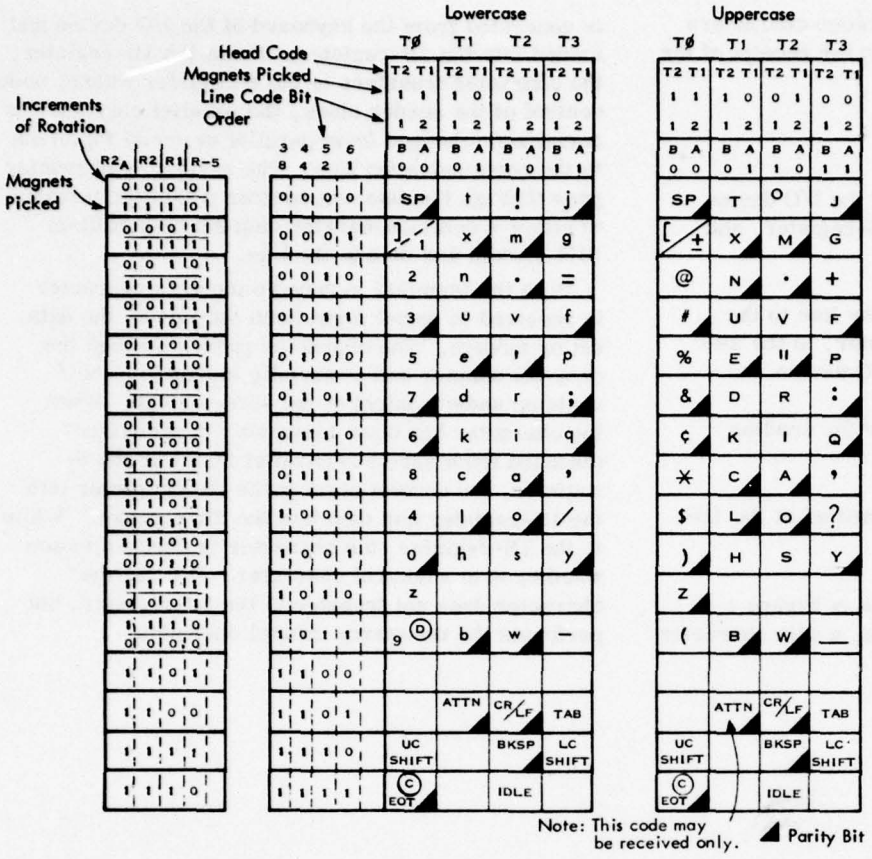


Figure 1-7. 2741 Printer Code Conversion (Correspondence Head)

Character Format

- The start of a 2740/2741 character is identified with a start (ST) bit and the end with a stop (SP) bit.
- The start bit is always a 0-bit (no-bit).
- The stop bit is always a 1-bit (bit).

A BCD character consists of seven data bits. In order to use this character as the input or output of the terminal, it is necessary to add two bit positions to the character. These bit positions are the start bit (ST) and stop bit (SP). The start bit will always be a 0-bit (no-bit) and the stop bit will always be a 1-bit (bit).

The start bit is added to the character so that the terminal can recognize the start of a new character. Otherwise, when a character enters the terminal, the terminal does not know where the character begins because the first data bit position might not contain a bit. When a start bit is added, however, the terminal knows that a character follows.

The stop bit separates characters. If there is no stop bit position, the two BCD characters "C" and "A" run together as follows:

ST	B	A	8	4	2	1	C	ST	B	A	8	4	2	1	C
0	1	1	0	0	1	1	1	0	1	1	0	0	0	1	0

Because the arrival of a start bit is not easily identified, a stop bit,which is always a 1-bit, is added at the end of the character. The two BCD characters "C" and "A" now appear:

ST	B	A	8	4	2	1	C	SP	ST	B	A	8	4	2	1	C	SP
0	1	1	0	0	1	1	1	1	0	1	1	0	0	0	1	1	1

The stop bit allows the interval between characters to reset the terminal in preparation for receipt of the next character.

DATA FLOW

- Transmit data flow is from the I/O device to the 1B-register, to the S-register, and then to the line.
- Receive data flow is from the line to the S-register, to the 1B-register, to the 2B-register, and then to the I/O device.
- The 2B-register is not used for sending operations.
- Control characters are identified at the 1B-register.

Data flow through the 2740 is shown in Figure 1-8. With the terminal in transmit mode, a data character is generated from the keyboard of the I/O device and loaded into the 1B-register. From the 1B-register, the character transfers to the S-register where, under control of the serdes clock, the parallel character is serialized (changed from parallel to serial form) out to the communication line. The serialized character goes through the data-set adapter within the terminal, to either a common-carrier data set or a built-in IBM modem and then to the line.

With the terminal in receive mode, a character is received in serial form from the line by the data set or modem. The character passes through the data-set adapter and is serially loaded into the S-register under control of the serdes clock. When the character has been completely deserialized (changed from serial to parallel form) by the S-register, the control clock gates the character into the 1B-register and then into the 2B-register. While in the 1B-register, the character is checked to see whether it is a control character. If it is, the character does not transfer to the 2B-register, but performs the necessary control operation.

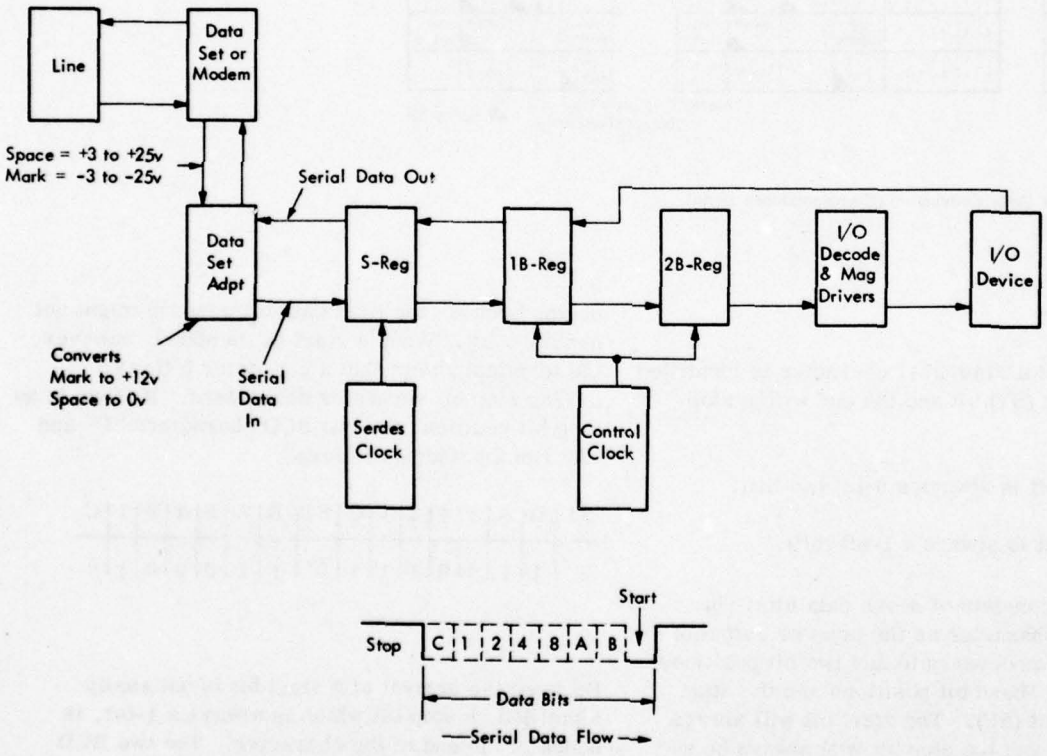


Figure 1-8. 2740/2741 Data Flow

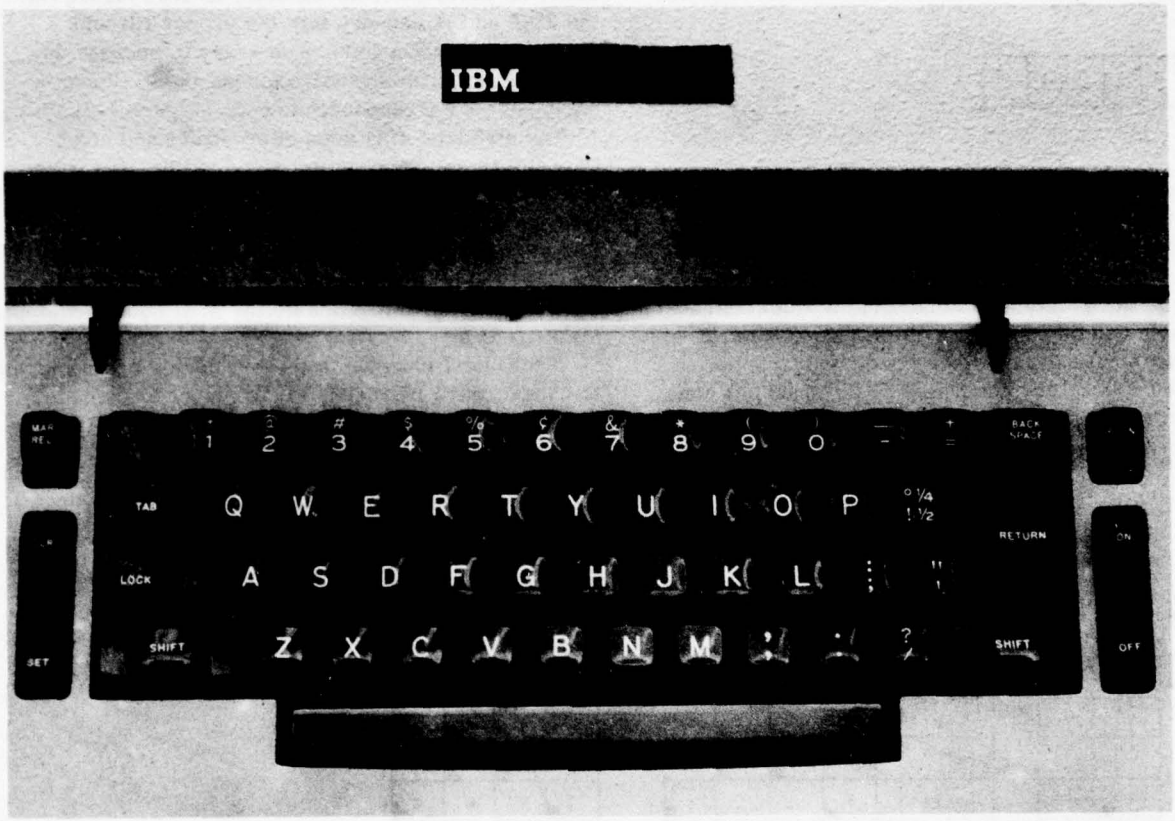


Figure 1-5. 2741 Keyboard

different typing element than the 2740, requiring the use of a different character code for the print characters. The code used is called correspondence code.

SPECIAL FEATURES (2741)

Dial-Up

The dial-up feature for the 2741 performs the same functions as for the 2740.

Interrupt

The interrupt feature allows the 2741 operator to interrupt the reception of a message from the computer so that he can send instructions.

Typamatic

The typamatic feature permits the operator to automatically repeat the Space, Backspace, and Underscore/Hyphen operations by holding the key depressed.

DATA REPRESENTATION

- Data is represented in the standard 2740 by BCD code.
- Data is represented in the standard 2741 by correspondence code.
- The check bit maintains odd parity for checking.

The standard 2740 uses Binary Coded Decimal (BCD) system (Figure 1-6). This code consists of six information bits and a check bit arranged as follows:

B	A	8	4	2	1	C

The six information bits (B,A,8,4,2,1) identify all alpha-numeric characters for the SELECTRIC I/O as well as all control codes needed to maintain semi-automatic operation during communication. The check bit maintains odd parity. A valid character contains an odd number of bits; any character code that is not odd is given a check bit.

A 2740 character, generated by the transmit contacts in the I/O device, is translated into BCD before leaving the I/O device. This is accomplished in a diode matrix located in the I/O device. The BCD code, as received from the line, is used throughout the 2740 and is decoded into the proper tilt and rotate, or function code, necessary to operate the I/O device. Upon special request, the 2740 can be equipped for correspondence code (Figure 1-7).

The standard 2741 uses correspondence code. Characters are sent and received by the 2741 in the same bit order as for the 2740. However, the bit configurations for the same characters are different. For example, the letter "A" in the 2740 is a BA1; in the 2741 the bit configuration for the letter "A" is a B421. Upon special request, the 2741 can be equipped for BCD code.

Mechanical changes to the I/O device are required to change from BCD code to correspondence code, and vice versa. No circuit changes are required.

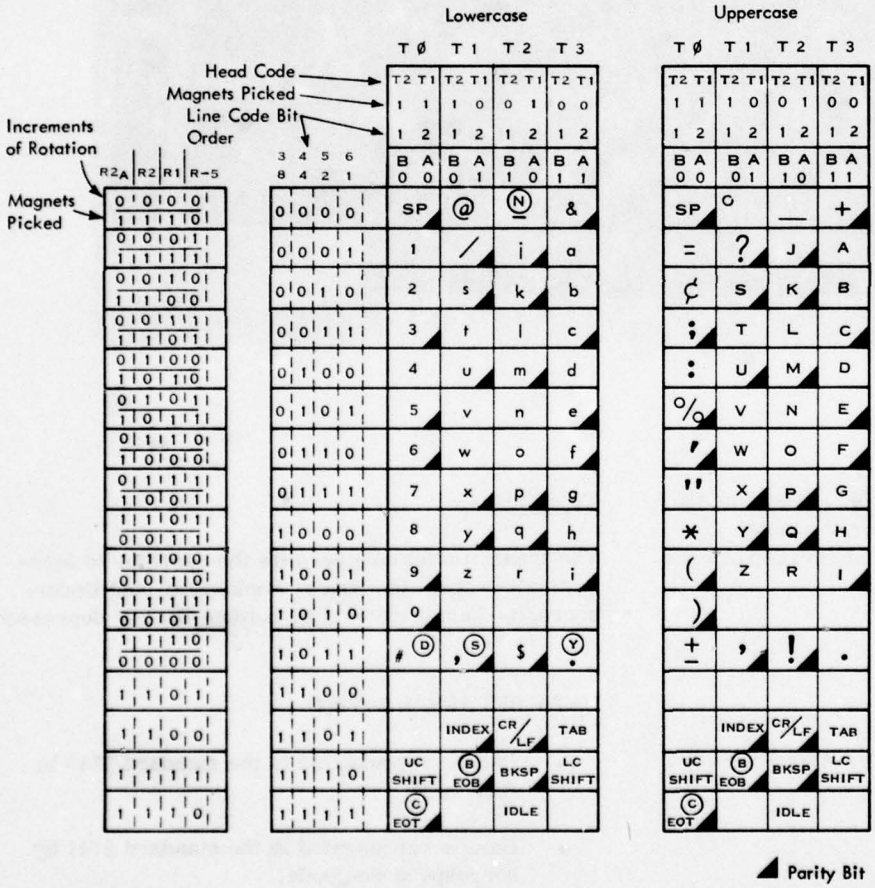


Figure 1-6. 2740 Printer Code Conversion (BCD)

Once the character reaches the 2B-register, it is checked to determine whether it is a print or function character. If it is a print character, the character is gated to the print-decode circuit and then to the I/O device to be printed. If the character is a function character, the character is gated into the function-decode circuit and from there into the I/O device to perform the function. The 2B-register is used only for receiving operations.

In summary, the received serial character is deserialized by the S-register, under control of the serdes clock. Then, under control of the control clock, the character transfers from the 1B-register to the 2B-register, and on to the I/O device. With the terminal in transmit mode, the parallel character is loaded directly into the 1B-register, transferred to the S-register, serialized, and sent out on the line.

S-REGISTER

- Converts parallel bits to serial (serialization).
- Converts serial bits to parallel (deserialization).
- Has a trigger for each of the six data bits, the check bit, and the start and stop bits.
- Receives data from the 1B-register when the terminal is sending, from the 'serial data in' line when the terminal is receiving.

All data entering or leaving the 2740/2741 is in serial-by-character, serial-by-bit form. To be usable in the terminal, the data must be in parallel-by-bit form. Therefore, data must be converted from serial to parallel form for a receiving operation and from parallel to serial form for a sending operation. The conversion processes, which are called serialization and deserialization, are performed by the S-register (shift register).

The S-register consists of nine triggers -- one each for the start, B, A, 8, 4, 2, 1, C, and stop bits -- and the appropriate gating circuits (Figure 2-1). The S-register is loaded with data from either the 1B-register (sending) or from the 'serial data in' line (receiving).

Serialization (Sending)

During sending operations, data generated by the I/O device transfers to the 1B-register. From the 1B-register the data is loaded into the S-register and serialized to the 'serial data out' line. The data transfers from the 1B-register to the S-register in parallel-by-bit form.

Before receiving the character from the 1B-register, the S-register is restored by turning all triggers on. To load the character then, those triggers that represent a no-bit in the character must turn off.

Seven ANDs form the transmit-mode input to the S-register. One input to each of these ANDs is conditioned by the absence of a bit in the associated position of the 1B-register. The common gating line, 'S0 reset,' completes conditioning the ANDs, causing the character in the 1B-register to transfer to the S-register. Bringing up 'S0 reset' also turns off 'S8' and enters the start bit for the character into the S-register. 'S8' is turned on by 'S register restore.' When 'S0 reset' comes up (loading the character into the S-register) no input is applied to 'S8,' so the stop bit is present for the character. The entire character is now in the S-register and must be serialized to the 'serial data out' line.

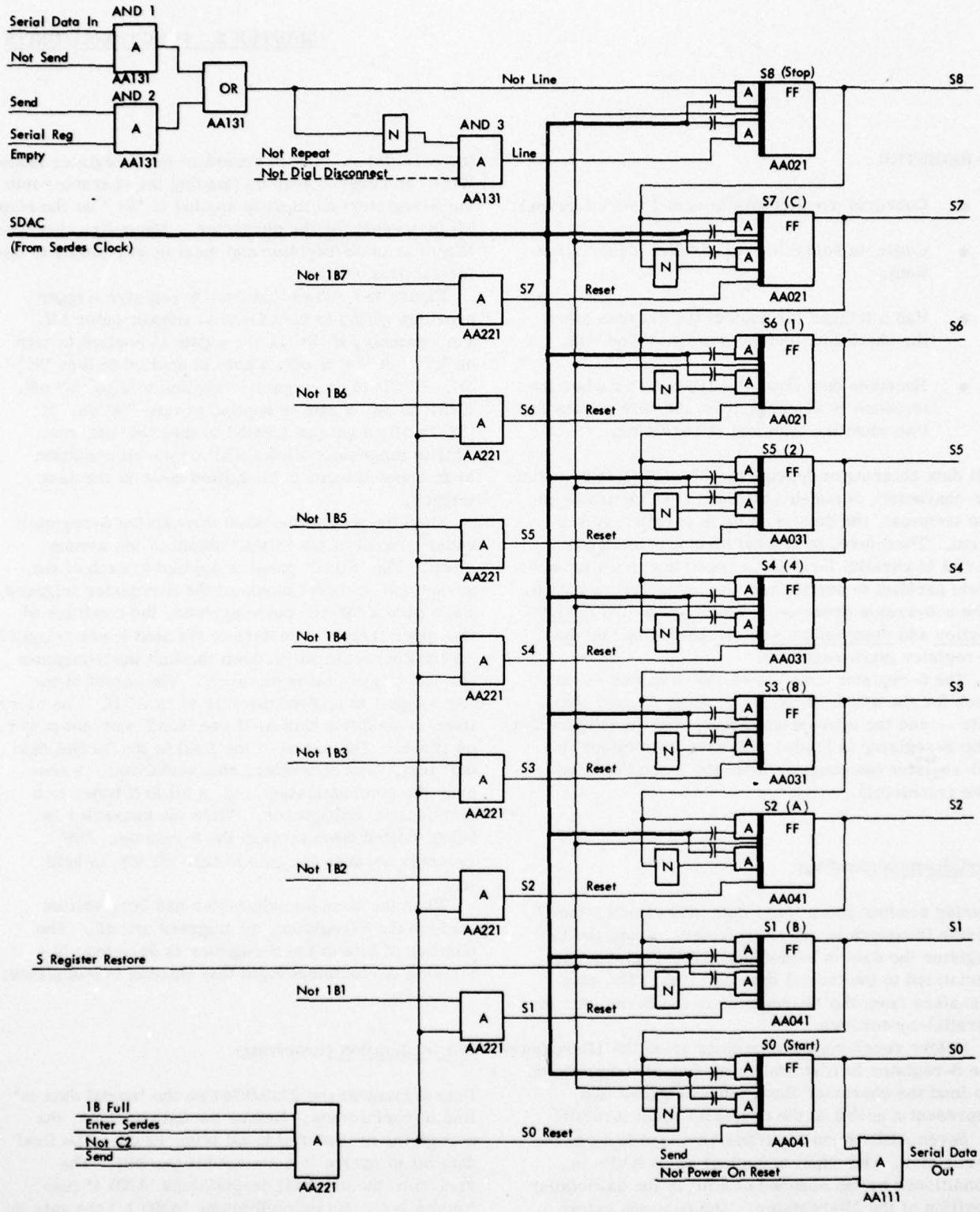
Figure 2-1 shows that each S-register trigger provides gating to turn the next trigger on or off. For example, if 'S8' is on, a gate is applied to turn on 'S7.' If 'S8' is off, a gate is applied to turn 'S7' off. If 'S7' is on, a gate is applied to turn 'S7' off. If 'S7' is on, a gate is applied to turn 'S6' on. If 'S7' is off, a gate is applied to turn 'S6' off, etc. This arrangement allows a bit or no-bit condition in an upper trigger to be shifted down to the next trigger.

The bits are shifted down through the S-register under control of the 'SDAC' output of the serdes clock. The 'SDAC' pulse is applied to each of the ac-set and ac-reset inputs of the S-register triggers. Each time a 'SDAC' pulse arrives, the condition of the upper trigger transfers to the next lower trigger. As the character shifts down through the S-register, the 'S0' trigger turns on or off. The output of the 'S0' trigger is applied directly to an AND. The other lines to condition this AND are 'send' and 'not power on reset.' The output of the AND is the 'serial data out' line. The character, now serialized, is sent over the communication line, a bit at a time, to a terminal or multiplexer. While the character is being shifted down through the S-register, 'S8' remains because the gate to turn off 'S8' is held up.

When the complete character has been shifted through the S-register, all triggers are off. The absence of bits in the S-register is detected, informing the terminal logic that shifting is completed.

Deserialization (Receiving)

Data arrives at the 2740/2741 on the 'serial data in' line in serial form. Before the data arrives, the S-register is restored to all triggers on. The first data bit to arrive is the start bit (no-bit). The arrival of the start bit deconditions 'AND 1' (see Figure 2-1). By deconditioning 'AND 1,' the gate to turn on 'S8' is deconditioned while the gate to turn off 'S8' is conditioned. The start bit also starts the serdes clock and the first 'SDAC' pulse from the serdes clock turns 'S8' off.



Note: Dotted lines indicate feature inputs.

Figure 2-1. S-Register

For this explanation, the character "A" is used. "A" consists of B-, A-, and 1-bits; therefore, following the start bit, the next bit received is a B-bit. The condition of the 'serial data in' line now reverses, conditioning 'S8' to turn on. The next 'SDAC' pulse transfers the start bit in 'S8' to 'S7,' and the B-bit is loaded into 'S8.' The next received bit is the A-bit. The 'serial data in' line remains up. The start bit transfers to 'S6,' the B-bit transfers to 'S7,' and the A-bit is loaded into 'S8.' The next received bit should be an 8-bit; since the letter "A" is being received, however, an 8-bit is not present (no-bit). The 'serial data in' line goes into a no-bit condition, conditioning 'S8' to turn off. The previously received bits are again stepped down one trigger position. This process repeats until the entire character has been serially loaded into and shifted down through the S-register.

When the start bit reaches the 'S0' trigger, the 'S0' trigger turns off. 'S0' off and 'S8' on (presence of a stop bit) notifies the terminal circuits that the S-register is now completely loaded with the character, and the character can transfer to the 1B-register for further use.

SERDES CLOCK

- Provides clock pulses to shift data through the S-register.
- Runs continuously for a sending operation.
- Runs only during character time for a receiving operation.

In order for data to be shifted through the S-register, a clocking pulse must be developed. The clocking pulse is the 'SDAC' pulse generated by the serdes clock. With the terminal in transmit mode, the serdes clock runs continuously. In receive mode, the serdes clock runs only during the time that a character is being received. The arrival of a valid start bit starts the serdes clock; the generation of an 'S register restore' pulse stops the clock.

The serdes clock consists of four triggers: 'SD1,' 'SD2,' 'SD3,' and 'SD4' (Figure 2-2). 'SD1' provides gating to 'SD2,' 'SD2' provides gating to both 'SD1' and 'SD3,' and 'SD3' provides gating to 'SD4.' This gating, plus the output from the 539 cps oscillator, allows the serdes clock to be cycled. Serdes-clock operation depends upon whether the 539 cps oscillator is gated or degated. If the oscillator is gated, the serdes clock runs; if the oscillator is degated, the serdes clock does not run. The outputs of the oscillator are the 'SDCAC1' and 'SDCAC2' pulses. These pulses, which are applied to triggers 'SD1,' 'SD2,' and'SD3,' are also used in other areas of the terminal.

The oscillator can be gated in one of three ways (Figure 2-2). With the terminal in transmit mode, the 'send' line holds the oscillator gated until the mode changes. For a receiving operation the arrival of a start bit brings up 'not line.' If 'not line' is up for at least half-a-bit time, 'SD4' turns on, holding the oscillator gated until 'SD4' is turned off by 'S register restore.' 'Not mode change' prevents the oscillator from being gated during a mode change. Although different methods are used to gate the serdes clock for sending and receiving operations, once gated, the clock cycles in the same manner for both operations. The difference is that the clock is stopped between characters during receiving operations. The following paragraphs describe the cycling sequence for a receiving operation. See Figure 2-2.

Whenever the oscillator is not gated on, 'not clock run' holds the 'SD1' and 'SD2' triggers off and the 'SD3' trigger on. 'SD4' would have been previously turned off by 'S register restore.' When the start bit is received, the oscillator is gated on, developing the 'SDCAC2' pulses and dropping 'not clock run.' The first 'SDCAC2' pulse turns on 'SD1' and 'SD3.' 'SD3' (off) turns on 'SD4.' 'SD4' wraps around to the input of the oscillator and takes over the oscillator gating. It takes about half-a-bit time from when the 'serial data in' line drops till 'SD4' turns on. If the line drop is caused by line noise, the line generally comes up before 'SD4' turns on. Thus, line noise is prevented from cycling the serdes clock and being recognized as a character. The serdes clock continues to cycle until the character is completely received and 'S register restore' comes up. 'S register restore' turns off 'SD4,' degating the oscillator and stopping the serdes clock. The inverted output of 'SD3' becomes the 'SDAC' pulse to drive the S-register.

The timing chart (see Figure 2-2) shows that the serdes clock acts as a frequency divider of the serdes oscillator. Because of clock timing, the 'SDAC' pulse comes up midway through a bit time so that slight variations in bit-time lengths do not cause character recognition errors.

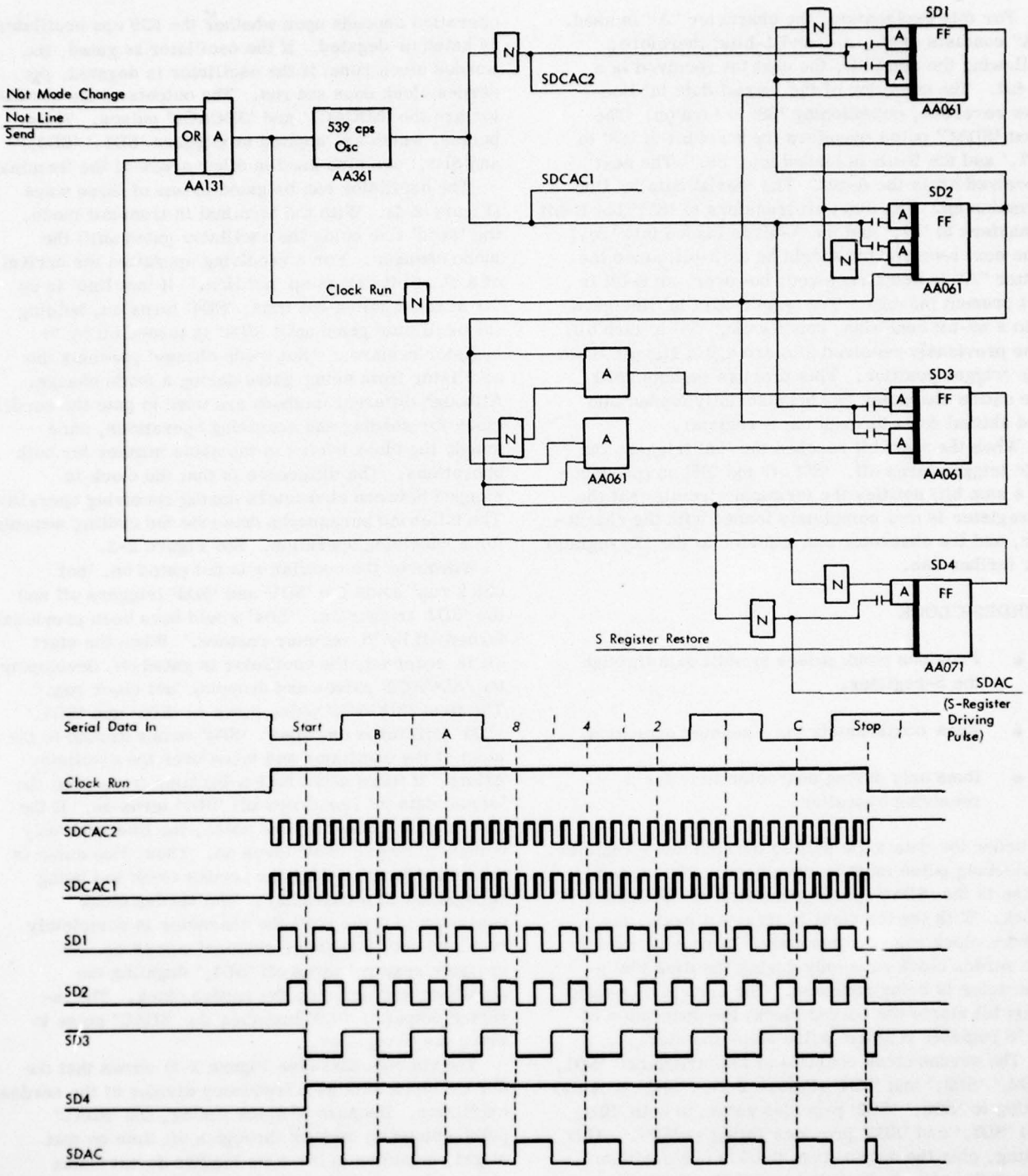


Figure 2-2. Serdes Clock

CONTROL CLOCK

- Provides timing for register-to-register transfers.

Once the character is in the S-register, the character transfers to the 1B-register and then to the 2B-register. The time allowed to transfer the characters is less than the time allowed to load the S-register. (A character must transfer through the registers during the time between characters.) Therefore, a control clock that runs at a faster rate than the serdes clock is provided.

The control clock consists of a continuously running 18 kc oscillator, two triggers, and associated gating circuits (Figure 2-3). The outputs of the oscillator, 'CC1' and 'CC2,' provide the ac-set and ac-reset pulses for the two control-clock triggers, 'C1' and 'C2.' 'CC1' and 'CC2' also provide ac pulses for other triggers throughout the terminal. When terminal power first comes up, the 'C1' and 'C2' triggers are turned off by 'power on reset.' 'C1' provides turn-on gating to 'C2'; 'C2' wraps around and provides the turn-off gate for 'C1.'

To start the control clock, a gate is provided to turn on C1. The AND/OR circuits at the left side of Figure 2-3 show the gating used for 'C1.' When the gate is present, 'CC1' turns the 'C1' trigger on. 'C1' and the next 'CC2' pulse turn 'C2' on. Both 'C1' and 'C2' are now on. 'C2' and the next 'CC1' pulse turn 'C1' off. 'C1' (off) and the next 'CC1' pulse turn 'C2' off. The control-clock cycle is completed.

As long as a gate is provided to turn on 'C1,' the clock keeps cycling. When the gate drops, the cycle ends and both 'C1' and 'C2' are off. 'C1' and 'C2' pulses provide the timing necessary to transfer the characters from the S-register to the 1B-register, then to the 2B-register, during receiving operations; and from the 1B-register to the S-register during sending operations. As shown in Figure 2-3, the 'C1' pulse has a duration of 50 microseconds and 'C2' a duration of 75 microseconds; the pulse time is caused by the sequence of operation of the control-clock triggers. The control-clock 'C1' and 'C2' output sequence is: 'not C1' and 'not C2,' 'C1' and 'not C2,' 'C1' and 'C2,' 'not C1' and 'C2.' This sequence transfers characters from register to register in an orderly way.

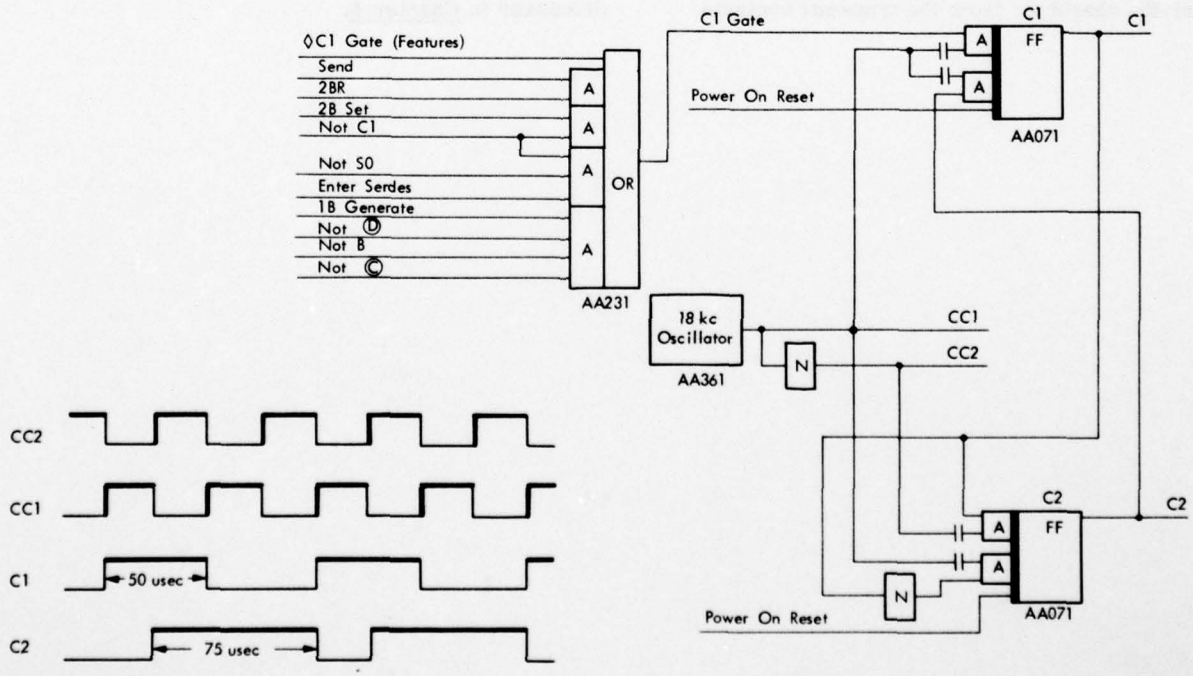


Figure 2-3. Control Clock

1B-REGISTER

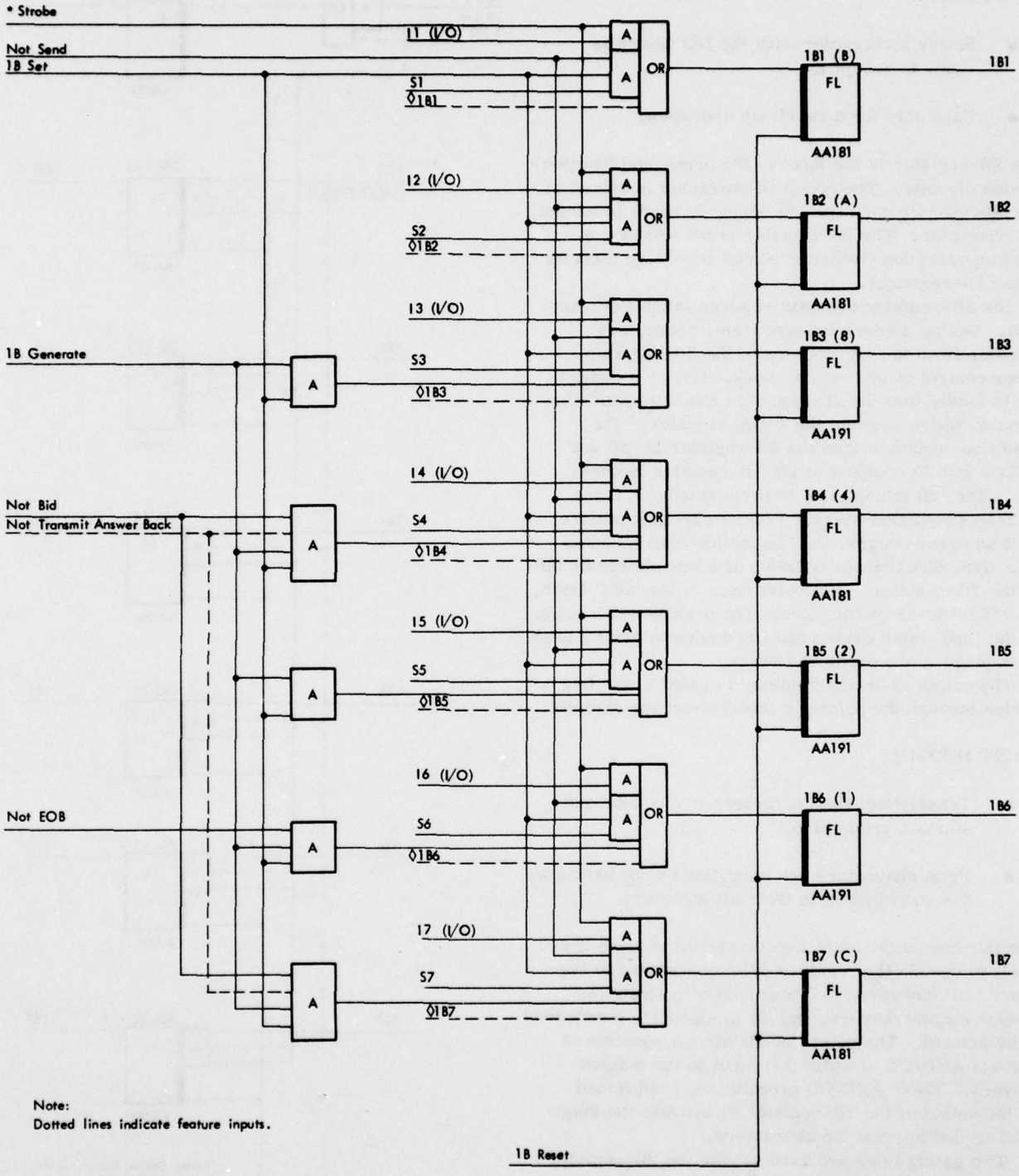
- Loaded from the S-register during receiving operations.
- Loaded directly from the I/O device during sending operations.
- Control characters loaded into 1B by the '1B generate' line.

The 1B-register is the intermediate storage buffer for the receiving operation and the main storage buffer for the sending operation. The 1B-register is loaded with a character from the S-register during receive operations. During transmit operations, the 1B-register can be loaded in three ways: (1) directly from the I/O device transmit contacts (print or function characters), (2) by bringing up the '1B generate line' (control characters), and (3) by ◊ (delta) inputs for some special features. Only the basic-terminal inputs are explained in this section.

With the terminal in transmit mode, when a key is pressed on the I/O keyboard, the I/O device takes a cycle. During the cycle, the transmit contacts for the desired character transfer, and a 1B-register gating pulse develops. This gating pulse is called '*strobe.' '*Strobe' tells the terminal that the I/O device is far enough along in its cycle to correctly transfer the character from the transmit contacts to the 1B-register. Figure 2-4 shows this input. The input from the I/O transmit contacts ('I1,' 'I2,' 'I3,' etc.) partially conditions the seven 1B-register input ANDs. When the '*strobe' line comes up, conditioning of the ANDs is completed, and the desired character is loaded into the 1B-register. The character then transfers, under control of the control clock, to the S-register for serialization.

Another group of ANDs loads the control characters. When the operator presses either the EOT or the bid key, the '1B generate' line comes up. '1B generate' conditions the ANDs to the 1B3,' '1B4,' '1B5,' '1B6,' and '1B7' latches. If the operator presses the bid key, the 'not bid' line (active for every operation but bid) deconditions the ANDs to the '1B4' and '1B7' latches, and a Ⓓ character (821) is loaded into the 1B-register. If the operator presses the EOT key, the Ⓒ character (8421C) is loaded into the 1B-register. Once in the 1B-register, the control character transfers to the S-register and is serialized.

With the terminal in receive mode, the input to the 1B-register is from the S-register. Another group of ANDs, one for each latch, is conditioned by 'not send,' '1B set,' and the output from the associated S-register trigger. The main gating factor is the '1B-set' line. After transferring to the 1B-register, the character then transfers to the 2B-register for printing or causing the desired function. The dotted lines in Figure 2-4 are for special features and are discussed in Chapter 4.



Note:
Dotted lines indicate feature inputs.

Figure 2-4. 1B-Register

2B-REGISTER

- Stores a character until the I/O device is ready to accept it.
- Used only for a receiving operation.

The 2B-register is the input to the print- and function-decode circuits. The received character is stored in the 2B-register until the I/O device is ready to accept the character. The 2B-register is not used for a sending operation (transmitted characters go directly to the 1B-register).

The 2B-register consists of seven latches (Figure 2-5). During a receiving operation, characters transfer from the 1B-register to the 2B-register, under control of the control clock. Before a character is loaded into the 2B-register, the '2B reset' line is made active to reset the entire register. The condition needed to load the 2B-register is '2B set' ANDed with the outputs of the 1B-register latches.

The '2B inhibit' line is present only on those 2740's equipped with the record-checking feature. If an error occurs, the '2B inhibit' line becomes active, blocking the transfer of a new character into the 2B-register. A special input to the '2B1' latch, '◊2B1,' turns on the latch. The presence of a bit in the '2B1' latch causes the I/O device to print a dash in place of the error character.

The output of the 2B-register is gated to the I/O device through the print- or function-decode circuits.

PRINT DECODE

- Translates print characters to I/O code and starts a print cycle.
- Print characters are identified by <u>not</u> having an 8-4 combination in their bit structure.

The purpose of the print-decode circuit (Figure 2-6) is (1) to decode the received print characters to the proper tilt and rotate I/O code, (2) to activate the proper magnet drivers, and (3) to cause the characters to be printed. The print-decode circuit consists of various AND/OR circuits that input to the magnet drivers. These AND/OR circuits are conditioned by the output of the 2B-register to activate the magnets needed to print the characters.

Two gating lines are used to gate the 2B-register character to the print-decode circuit: 'print-out' and 'print.' The 'print' line indicates that the character to be decoded is a print character. This line comes up when an 8-4 combination is <u>not present</u> in the character. The combination of an 8 and 4 in the character designates a function character,

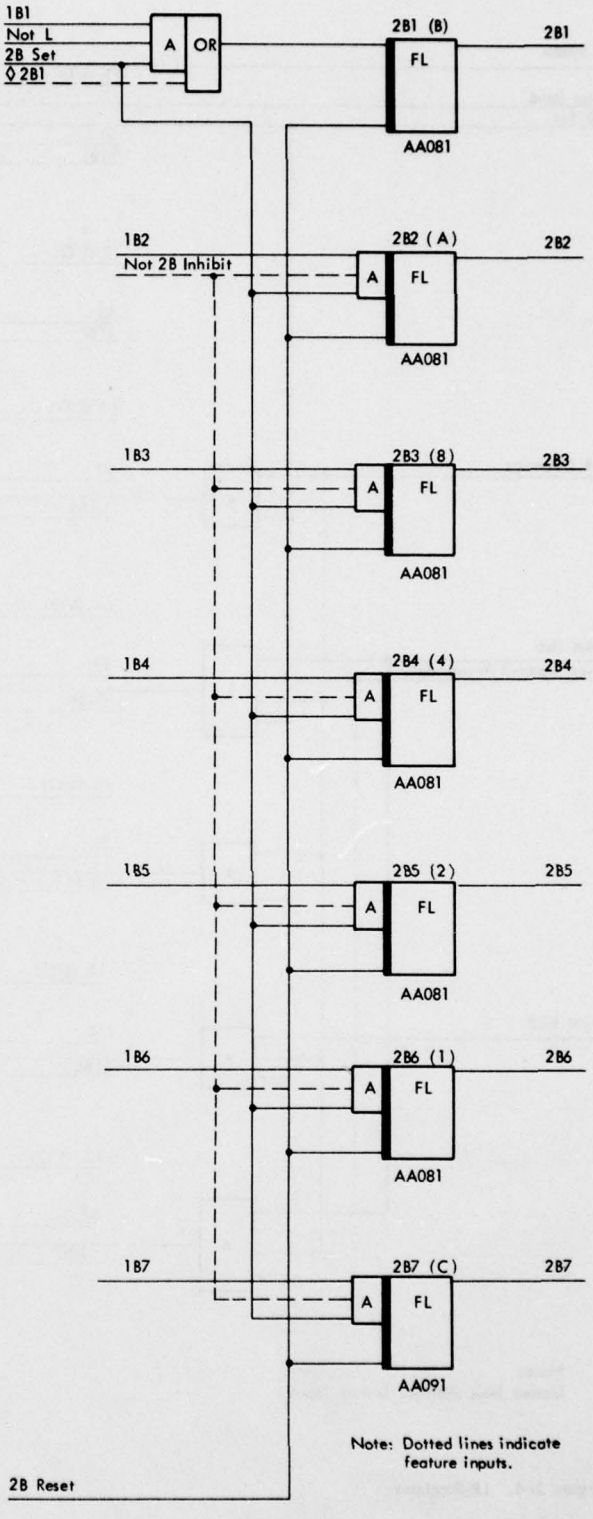


Figure 2-5. 2B-Register

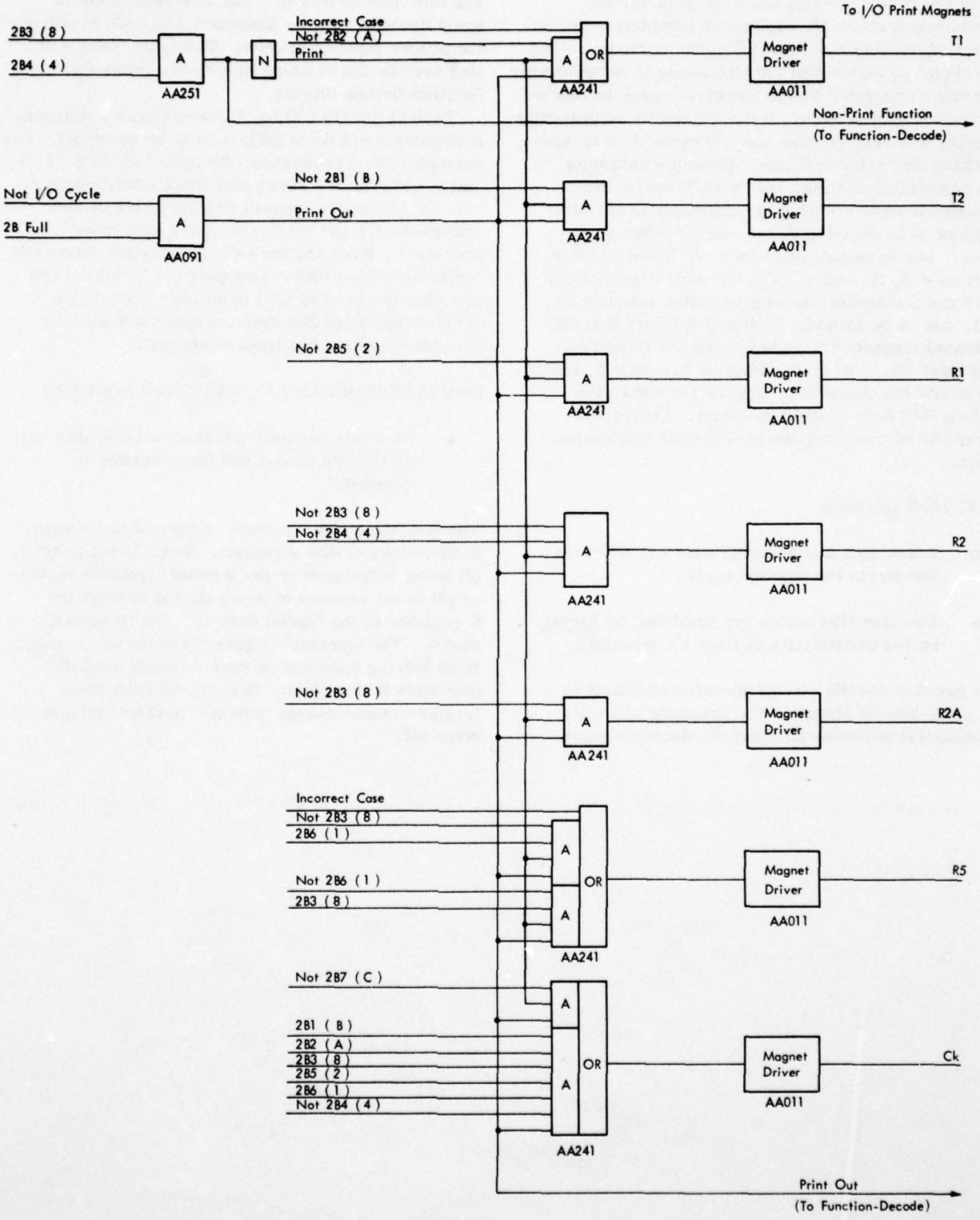


Figure 2-6. Print Decode

causing the function-decode circuit to be gated. The 'print out' line comes up when '2B register full' (indicating that the 2B-register is completely loaded with a character) and 'not I/O cycle' come up. 'Not I/O cycle' indicates that the I/O device is not presently printing a character and is therefore ready to receive the incoming character. If the I/O device is presently printing a character, the 'not I/O cycle' line is down, blocking the 'print-out' line. When the character has completed printing, the 'not I/O cycle' line becomes active, allowing the character in the 2B-register to be decoded and to start another print cycle. For example, character "A" consists of the BCD code B, A, and 1. The I/O code requires that tilt 1 and 2 magnets, as well as rotate magnets 2A, 2, 1, and -5 be picked. Figure 2-6 shows that the indicated magnets are picked by the BCD code of character "A." When the magnets are picked, the I/O prints the character. Figure 1-6 shows the BCD-to-I/O code conversion chart. Figure 1-7 shows the correspondence-to-I/O code conversion chart.

FUNCTION DECODE

- Translates function characters to I/O code and starts the function cycle.
- Function characters are identified by having an 8-4 combination in their bit structure.

The function-decode circuit operates similarly to the print-decode circuit. The presence of an 8-4 combination activates the function-decode circuit. If the character contains an 8 and 4, the 'non-print function' line comes up. The character code is again decoded into the necessary I/O code to activate the proper function magnet. The same 'print-out' line used by the print-decode circuit gates the function-decode circuit.

Each of the six I/O functions requires a different combination of bits in BCD code to be activated. For example, for a backspace, the BCD code is B, 8, 4, and 2. Figure 2-7 shows that these conditions activate the backspace-magnet driver. This in turn causes the I/O device to perform a backspace operation. When the backspace operation starts, the 'print-out' line drops. Dropping the 'print out line prevents the printing of a print character or the performing of another function operation until the present operation has been completed.

OPERATE TRIGGER (OPERATION IN PROCESS)

- Prevents the terminal from leaving transmit or receive mode until the operation is complete.

The function of the 'operate' trigger is to indicate to the terminal that a character is (1) being printed, (2) being acted upon by the terminal (receive mode), or (3) in the process of being shifted through the S-register to the 'serial data out' line (transmit mode). The 'operate' trigger prevents the terminal from leaving transmit or receive mode until the operation is complete. The status of the mode triggers cannot change until the 'operate' trigger turns off.

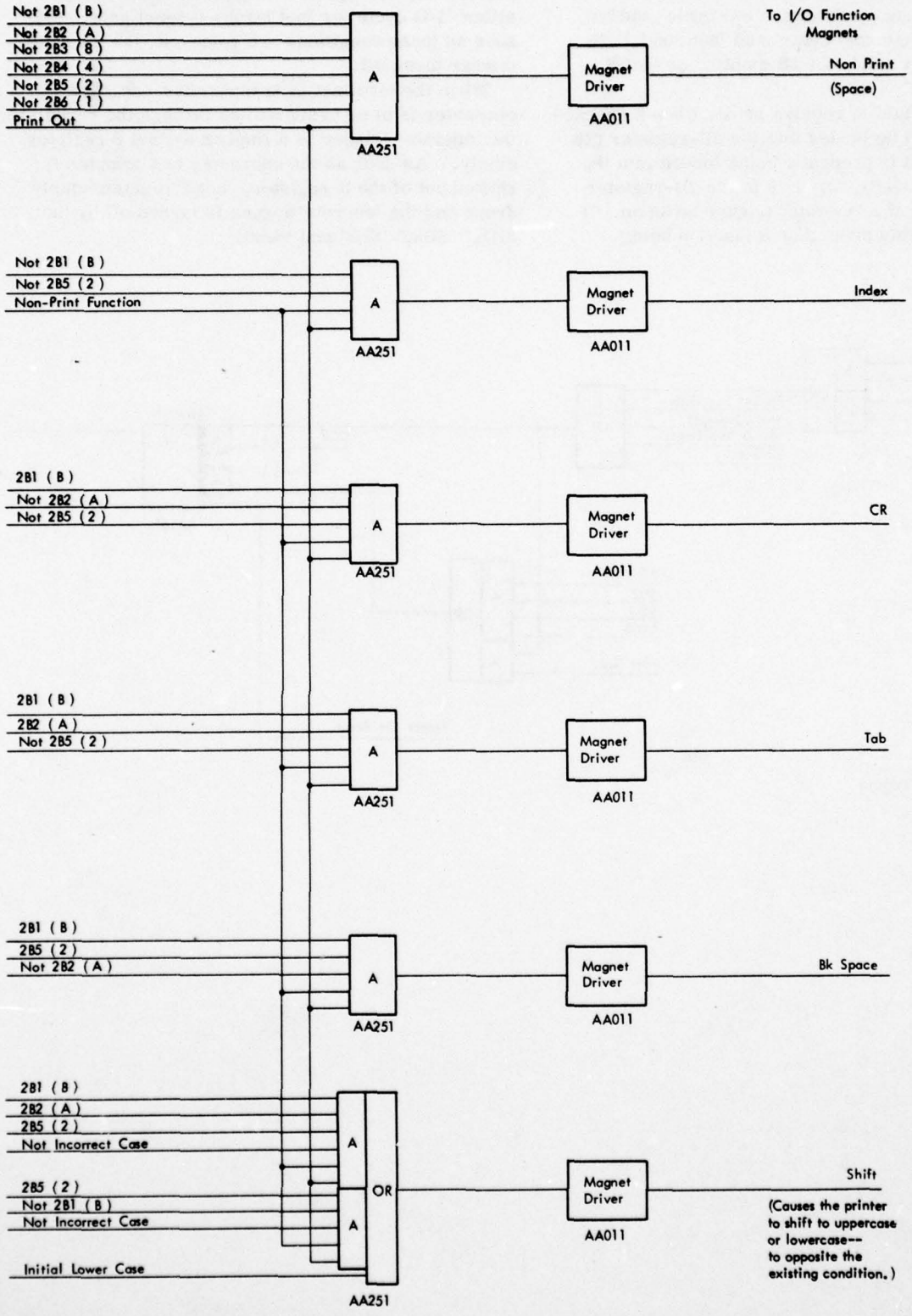


Figure 2-7. Function Decode

The 'operate' trigger (Figure 2-8) is turned on by any of the following conditions: 'I/O cycle' and 'not send,' 'not strobe 0 reset gate' and 'not send,' '2B set set gate,' '2B set,' 'not 2B empty,' or 'not S register empty.'

With the terminal in receive mode, when a character (1) is about to be loaded into the 2B-register ('2B set set gate'), (2) is presently being loaded into the 2B-register ('2B set'), (3) or is in the 2B-register ('not 2B empty'), the 'operate' trigger turns on. If a character is being printed or a function being performed, the 'operate' trigger is turned on by either 'I/O cycle' or 'not strobe 0 reset gate.' As soon as these conditions are removed, the 'operate' trigger turns off.

When the terminal is in transmit mode, and a character is in or being shifted through the S-register, the 'operate' trigger is turned on by 'not S register empty.' As soon as the character has completely shifted out of the S-register, 'not S register empty' drops and the 'operate' trigger is turned off by 'not SD1,' 'SD2,' 'SD3' and 'send.'

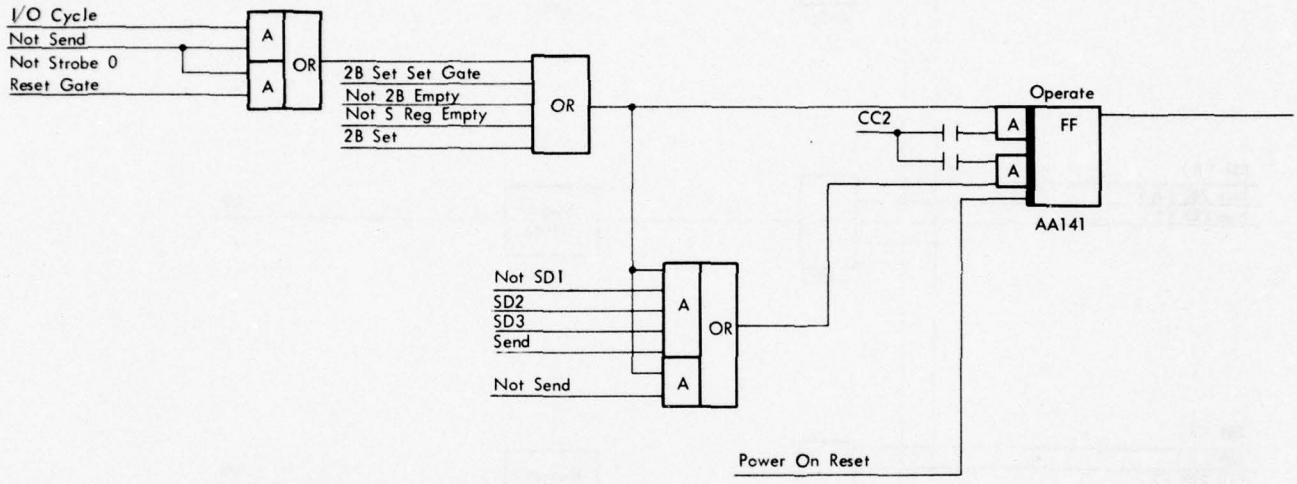


Figure 2-8. Operate Trigger

2740 COMMUNICATION TERMINAL

BASIC-TERMINAL MODE CONTROL

- All terminal operations are determined by the terminal mode.
- The basic-2740 mode is determined by the condition of mode triggers 'A' and 'B.'
- In the basic 2740 there are three modes: (1) 'A' and 'B' on (control-receive mode), (2) 'A' on and 'B' off (transmit-text mode), and (3) 'A' off and 'B' on (receive-text mode).

The mode in the basic 2740 is determined by the condition of two triggers: the 'A' trigger and the 'B' trigger. When both the 'A' and 'B' triggers are on, the 2740 is in control-receive mode. While in control-receive mode, the 2740 can receive any of the control characters, such as the bid character Ⓓ . When only the 'A' trigger is on, the 2740 is in transmit-text mode. When only the 'B' trigger is on, the 2740 is in receive-text mode. If the 2740 is equipped with some of the special features, many more modes are possible with the addition of other mode triggers. For this explanation, however, just the basic 2740 is discussed.

When machine power first comes up in the 2740, the 'power on reset' line turns both the 'A' and 'B' mode triggers on, putting the 2740 into control-receive mode (Figure 3-1).

To send data with the 2740, the terminal is placed into transmit-text mode. This is accomplished by turning off the 'B' mode trigger. The operator presses the Bid key to turn on the 'bid' trigger. 'A,' 'B,' and 'bid' bring up the 'B reset gate' line, which turns off the 'B' mode trigger. An AND connected to the mode-trigger outputs determines whether the 2740 is in transmit or in receive mode. If the AND is conditioned by 'A' on and 'B' off, the 'send' line comes up. If any other condition exists, the 'not send' line is active.

'B reset gate' also conditions an OR that turns on the 'mode change' trigger. Every time a change in modes occurs, the 'mode change' trigger turns on to provide a reset to some of the 2740 circuits. The 'mode change' trigger then gates itself off with the next 'CC1' pulse.

When the bid character Ⓓ is received at the receiving terminal, the 'A' trigger turns off, putting the 2740 in receive-text mode. The 'A' trigger is turned off by the conditions: 'status,' ' Ⓓ ,' 'B,' and 'A.' These conditions bring up the 'A reset gate' line.

To stop sending, the sending terminal operator presses the EOT key. A Ⓒ is sent and the terminal goes into control-receive mode. The mode change is accomplished by turning on the 'B' mode trigger. 'Send,' ' Ⓒ ,' 'not operate,' 'not EOT,' and 'end-of-state' bring up the 'B set gate,' returning the terminal to control-receive mode.

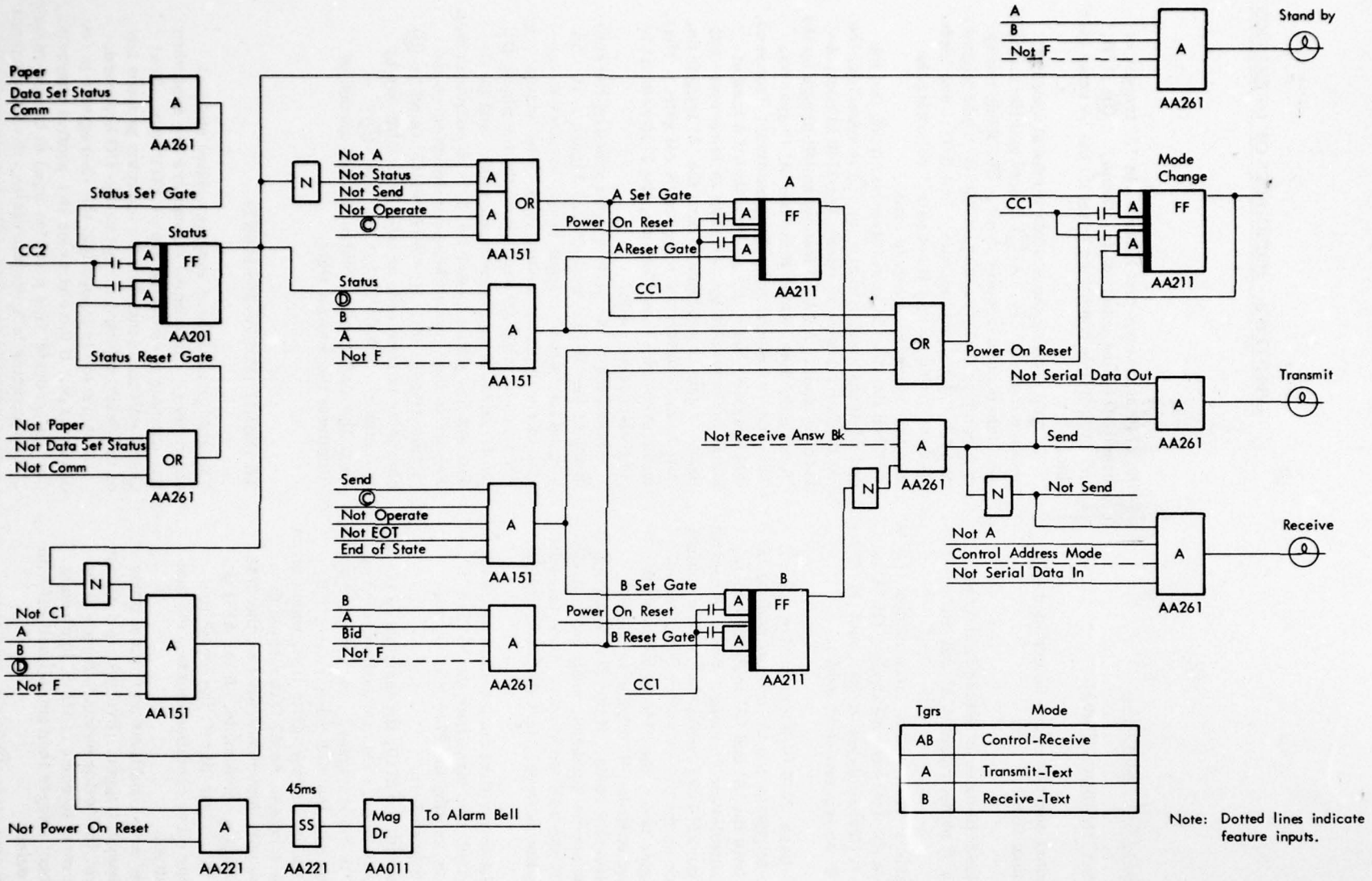
When the 2740 is in receive-text mode and the end-of-transmission character Ⓒ is received, the 'A' trigger turns on to return the 2740 to control-receive mode. An AND feeding an OR brings up the 'A set gate' line, which turns the 'A' trigger on. This line is brought up by the conditions: 'not send,' 'not operate,' and ' Ⓒ .' Note that if a loss of status occurs while the terminal is in receive-text mode, a gate is provided to turn the 'A' trigger on. 'Not A' and 'not status' bring up 'A set gate.' Thus, in the event of a loss of status, the 2740 returns to control-receive mode.

The status of the 2740 is determined by the condition of the 'status' trigger (see Figure 3-1). As long as the 'status' trigger is on, the 2740 is capable of receiving or sending data. The 'status' trigger turns on when (1) paper is in the terminal, (2) the terminal is in communicate mode, and (3) the data set has status (power on, able to communicate). Failure to have any of these conditions turns the 'status' trigger off. If, while 'status' is off, a Ⓓ character is received, an AND -- conditioned by 'not status', 'not C1,' 'A,' 'B,' and ' Ⓓ ' -- rings the alarm bell. 'Status' is also needed to illuminate the Standby light.

TRANSMIT (POINT-TO-POINT)

The 2740 is capable of sending control and text characters. The control characters are sent when the operator presses the Bid or EOT keys. Text characters are sent when the operator presses any of the print or function keys on the I/O keyboard.

A character is loaded into the 1B-register in one of two ways. If the character is a control character, the '1B generate' line provides input to the 1B-register. If the character is a text character, the I/O transmit contacts provide the input. The flowchart (Figure 3-2) shows the sending sequence.



Tgrs	Mode
AB	Control-Receive
A	Transmit-Text
B	Receive-Text

Note: Dotted lines indicate feature inputs.

Figure 3-1. Mode Triggers (Base 2740)

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

5 OF 8
ADA 066413



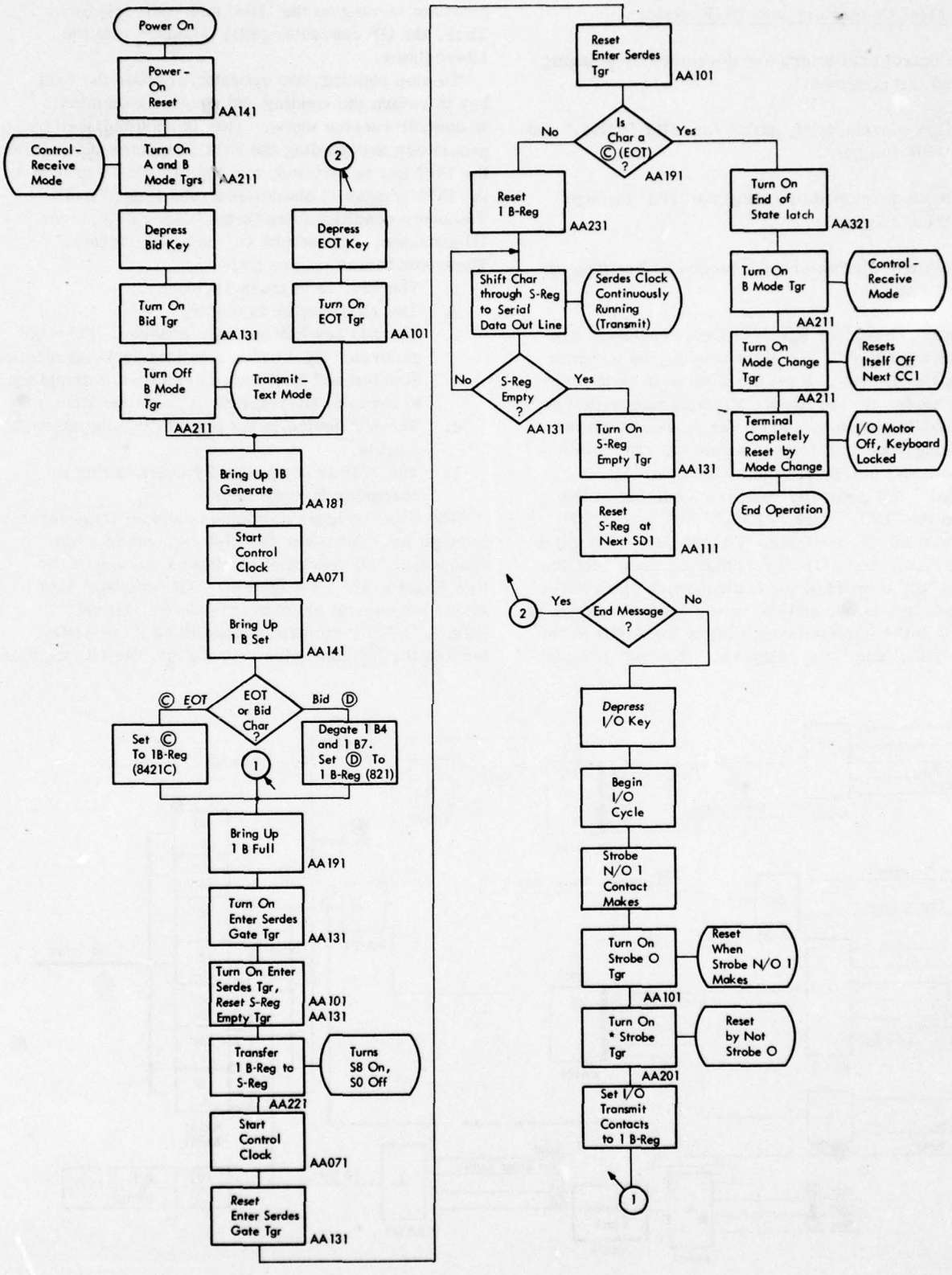


Figure 3-2. Transmit Flowchart

Load Control Characters Into 1B-Register

- Control characters are developed by bringing up '1B generate.'
- Ⓓ is developed by gating the '1B3,' '1B5,' and '1B6' triggers.
- Ⓒ is developed by gating the '1B3' through '1B7' triggers.
- Control characters are loaded by bringing up '1B set.'

The control character inputs to the 1B-register are shown in Figure 3-3. To start sending, the operator presses the Bid key. If (1) the 2740 is in control-receive mode, (2) the Local/Communicate switch is in the COMM position, and (3) the serdes clock is not running, the 'bid' trigger turns on. The 'bid' trigger on and the 'send' line up bring up '1B generate.' '1B generate' conditions one leg of the ANDs to the '1B3,' '1B4,' '1B5,' '1B6,' and '1B7' triggers of the 1B-register. '1B generate' also gates on the control clock. '1B set' comes up when both the 'C1' and 'C2' outputs of the control clock are active, the 'send' line is up, and the 'enter serdes' trigger is off. '1B set' completes conditioning the ANDs to the '1B3,' '1B5,' and '1B6' triggers. The 'bid' trigger prevents turning on the '1B4' and '1B7' triggers. Thus, the Ⓓ character (821) is loaded into the 1B-register.

To stop sending, the operator presses the EOT key to return the sending and receiving terminals to control-receive mode. This is accomplished by generating and sending the EOT character Ⓒ. When the EOT key is pressed, one leg of an AND to turn on the EOT trigger is conditioned (see Figure 3-3). The other conditions are 'send,' '1B empty,' 'not 1B generate,' 'not strobe O,' and 'not operate.' These conditions ensure that:

1. The 2740 is in transmit mode.
2. The 1B-register is empty.
3. The Bid key has not been pressed. (The '1B generate' input acts as an interlock, preventing both bid and EOT characters from attempting to load the 1B-register at the same time.)
4. The I/O device is not presently going through a cycle.
5. The 2740 is not presently transferring a character through logic.

The 'EOT' trigger coming on causes '1B generate' to come up. As when the 2740 is sending a bid character, '1B generate' conditions one leg of the five ANDs to the 1B-register. '1B generate' also starts the control clock to provide the '1B set' pulse. '1B set' completes conditioning the ANDs, loading the Ⓒ character (8421C) into the 1B-register.

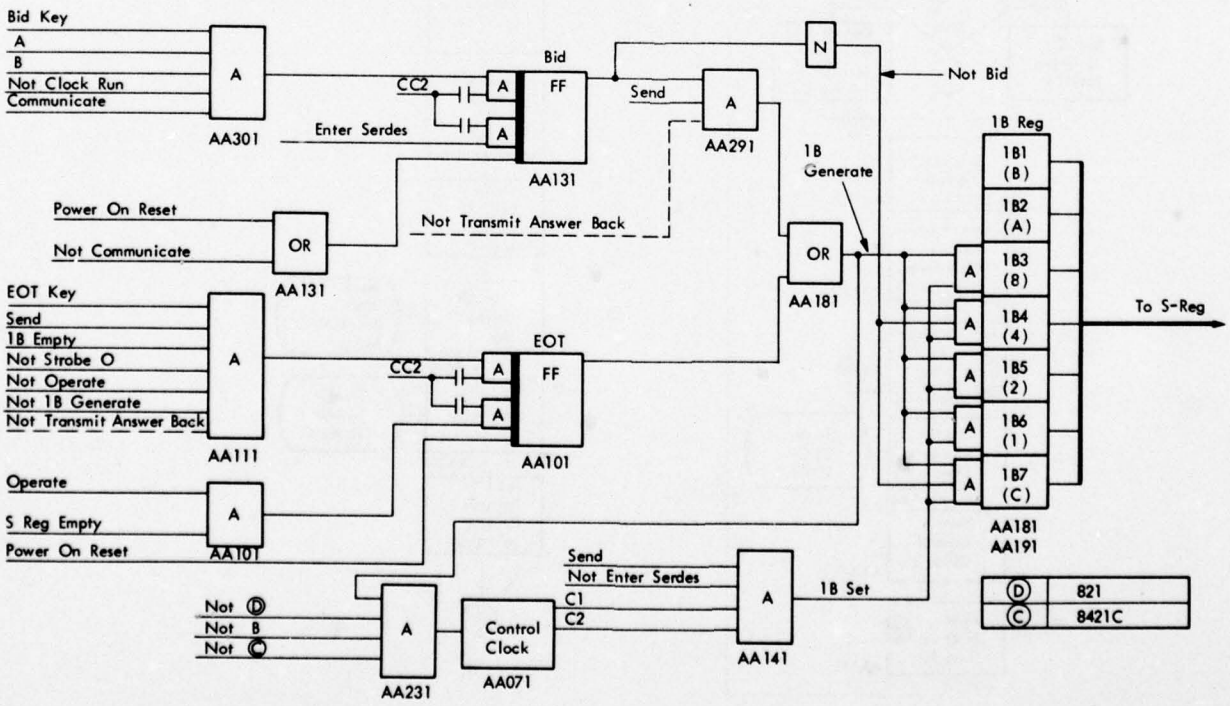


Figure 3-3. Generate Control Characters

Load Text Characters Into 1B-Register

- Text characters originate at the I/O transmit contacts.
- Text characters are loaded into the 1B-register by the '*strobe' line.

When the operator presses a key on the I/O keyboard, transmit contacts in the I/O device transfer into the bit configuration of the desired character. When gated, these contacts condition the ANDs that load the desired character into the 1B-register (Figure 3-4). As the I/O device goes through its cycle, 'C7' (in the I/O device) makes, bringing up the 'strobe N/O 1' line. 'Strobe N/O 1' -- ANDed with 'send,' 'not 1B generate,' and '1B empty' -- turns on the 'strobe O' trigger. 'Strobe O' gates on the '*strobe' trigger, which loads the text character into the 1B-register. The strobe circuit insures that the I/O device has had enough time to properly transfer the transmit contacts before gating through them to the 1B-register. The control clock is not started at this time; the character is loaded into the 1B-register without need of the control clock outputs.

Transfer Characters from 1B-Register to S-Register

- S-register restored by 'S register empty.'
- ' Enter serdes' transfers the character in the 1B-register to the S-register.
- 1B is reset by the control clock.

Once in the 1B-register, all characters (control or text) transfer to the S-register in the same manner. When a character is in the 1B-register, '1B full' comes up. If the 'S register empty' trigger is on and the I/O device is not presently going through a cycle (noted by 'not strobe O'), the 'enter serdes gate' turns on (IOP 1-A5--diagram manual). The 'enter serdes gate' trigger allows the 'S register restore' pulse to occur before a new character is loaded. 'S register restore' is accomplished by delaying the turning on of the 'enter serdes' trigger. As soon as the previous character is shifted out of the S-register, the 'S register empty' trigger turns on. 'S register empty' turns on the 'enter serdes gate' trigger and, ANDed with 'SD1' and 'send' applies the restore pulse to the S-register. 'Enter serdes gate' and the next 'SDAC' pulse turn the 'enter serdes' trigger on and the 'S register empty' trigger off.

'Enter serdes' -- along with '1B full,' 'not C2,' and 'send' -- conditions an AND (IOP 1-B5), the output of which, 'S0 reset,' is the gating pulse that transfers the character from the 1B-register to the S-register. 'S0 reset' also goes directly to the 'S0' trigger, turning it off, which loads the start bit for the character. 'S register empty' ANDed with 'send' has already loaded the stop bit (IOP 1-B6). When 'S0' turns off, the control clock starts. The control clock outputs, 'C1' and 'C2,' turn off the 'enter serdes' trigger (IOP 1-A5) and reset the 1B-register.

The complete character is now in the S-register and must be serialized to the 'serial data out' line.

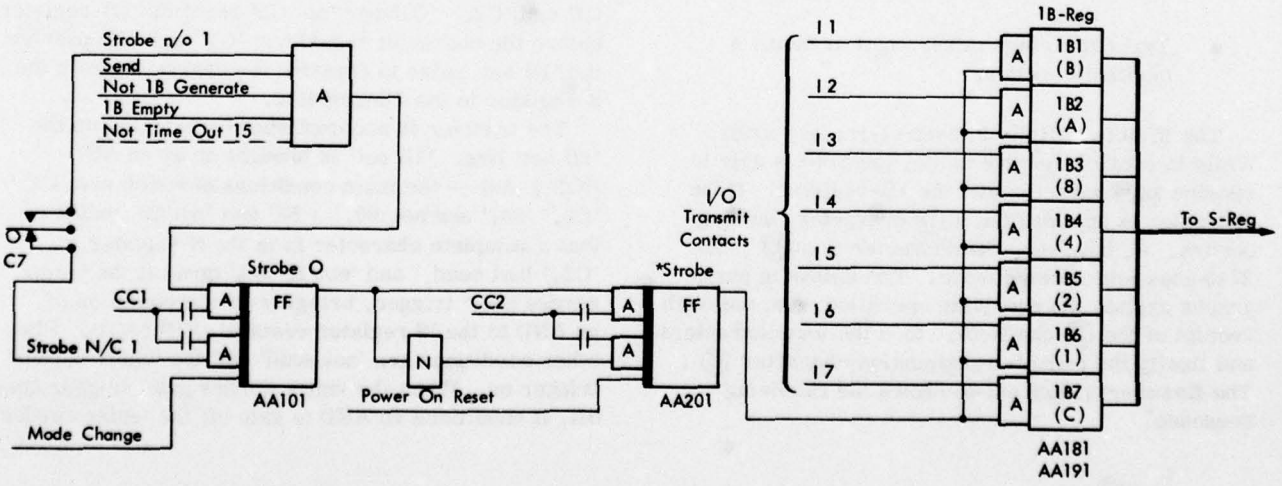


Figure 3-4. Transmit Text Characters

S-Register to 'Serial Data Out' Line

During sending operations, the serdes clock is continuously running, providing 'SDAC' pulses to the S-register. When the character is received in the S-register, it immediately begins to shift down through the S-register, bit-by-bit, to an AND. The AND is conditioned by 'send' and 'not power on reset' (IOP 1-B6). The output of the AND is the 'serial data out' line. When the character has completely shifted down through and out of the S-register, the 'S register empty' trigger turns on, and the S-register is restored.

End-of-Transmission

When an EOT character is generated and sent, it causes the sending and receiving terminals to go into control-receive mode. In the sending terminal, the EOT character is detected when it is in the 1B-register. The EOT character brings up the line ' Ⓒ ' (IOP 1-C4). The ' Ⓒ ' line turns on the end-of-state' latch and the 'B' mode trigger. The 'end-of-state' latch prevents the 1B-register from resetting. The reset is prevented because the terminal mode cannot change until the complete EOT character is sent. If the '1B register reset' were not prevented, ' Ⓒ ' would be reset from 1B before the terminal mode could change. When the 'B' mode trigger turns on, a mode change occurs. 'Mode change' then resets the 1B-register.

RECEIVE (POINT-TO-POINT)

- The 2740 receives either control or text characters.
- Control characters change mode operation.
- Text characters either print or cause a function to occur.

The 2740 is initially in control-receive mode. While in control-receive mode, the 2740 is able to receive any character into the 1B-register. If the character is anything but a Ⓓ character, nothing occurs. If, however, the character is a Ⓓ , the 2740 goes into receive mode. The following paragraphs explain the receiving operation, starting with receipt of the Ⓓ character, then the text characters, and finally the end-of-transmission character Ⓒ . The flowchart (Figure 3-5) shows the receiving sequence.

Receive Bid Character Ⓓ

- Receipt of Ⓓ causes 2740 to go into receive mode.
- Ⓓ detected in 1B-register.

When the 2740 is to receive a message, the sending terminal sends the bid character Ⓓ . The Ⓓ character is received and detected, putting the receiving terminal into receive mode. If any character other than a Ⓓ is received, the terminal remains in control-receive mode.

The first bit to arrive on the communication line is the start bit. The serdes clock does not run continuously during receiving operations; therefore, the start bit starts the serdes clock. The start bit arrives (on the 'serial data in' line) at an AND conditioned by 'not send' (IOP 2-A1). 'Not send' is up for receive and control-receive modes. The start bit turns off the 'S8' trigger and starts the serdes clock. (The S-register was previously restored to all-triggers-on when power was brought up or when the mode changed.) The start bit, along with 'not send' and 'S0,' also conditions an AND to turn on the 'enter serdes gate' trigger. The 'enter serdes gate' trigger gates on the 'enter serdes' trigger. After the character received by the S-register is transferred to the 1B-register, the 'enter serdes' and 'enter serdes gate' triggers cause the S-register to be restored.

Meanwhile, the bits arriving on the 'serial data in' line are gated into 'S8' and from there are shifted down through the S-register until the start bit reaches the 'S0' trigger. The 'S0' trigger (ANDed with 'enter serdes' and 'not C1') starts the control clock. The sequence of the control clock pulses is 'not C1' and 'not C2,' 'C1' and 'not C2,' 'C1' and 'C2,' and 'not C1' and 'C2.' 'C1' and 'not C2' reset the 1B-register before the character transfers; 'C1' and 'C2' provide the '1B set' pulse to transfer the character from the S-register to the 1B-register.

The transfer is accomplished by bringing up the '1B set' line. '1B set' is brought up by an AND (IOP 2-A3) -- the main conditions of which are 'C1,' 'C2,' 'S8,' and 'not S0.' ('S8' and 'not S0' indicate that a complete character is in the S-register.) 'C2,' 'not send,' and 'not 2B set' turn off the 'enter serdes gate' trigger, bringing up one condition of an AND to the 'S register restore' (IOP 2-C1). The other conditions are 'not send' and the 'enter serdes' trigger on. When the 'enter serdes gate' trigger goes off, it conditions an AND to gate off the 'enter serdes'

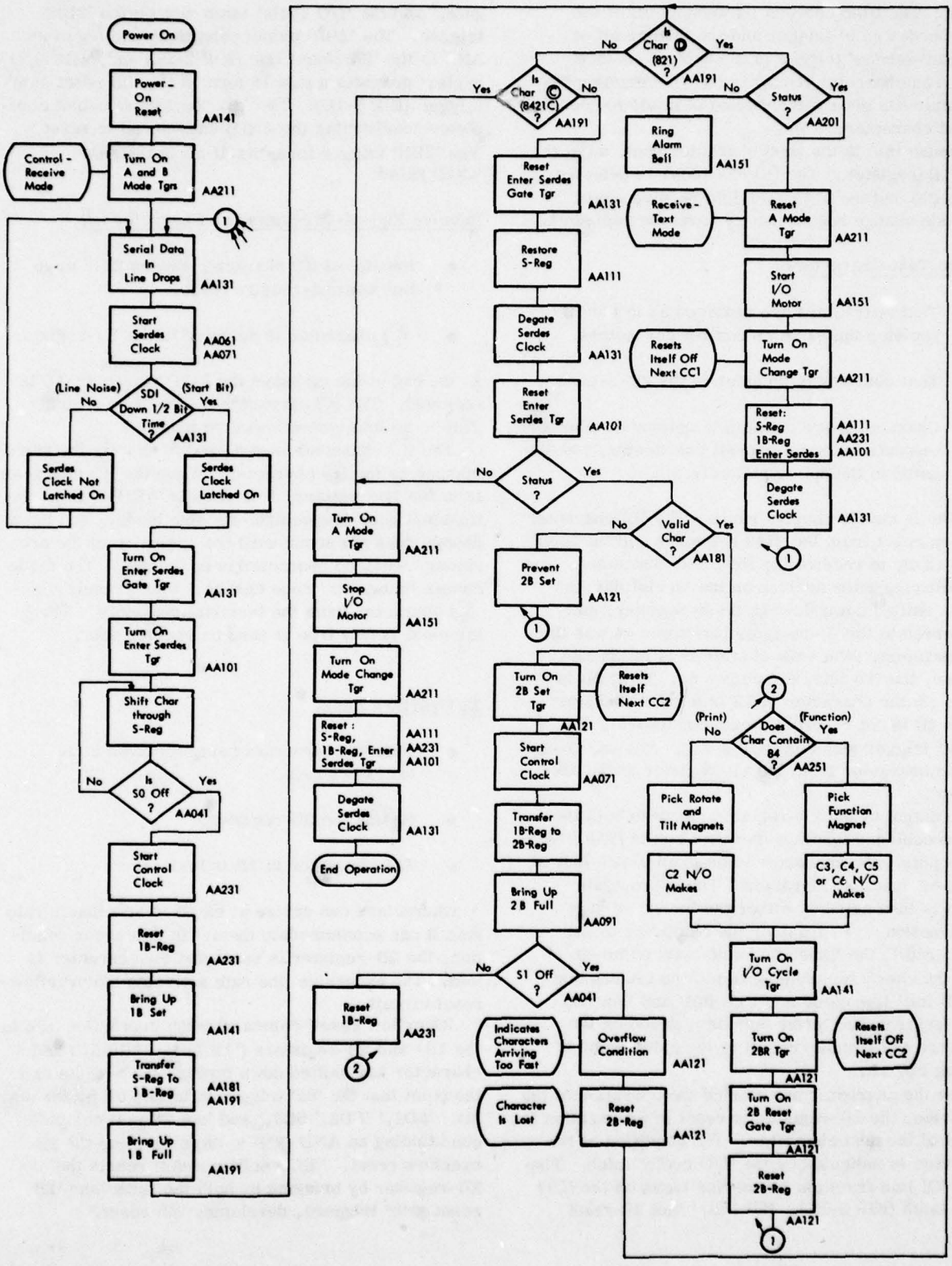


Figure 3-5. Receive Flowchart

trigger. The time between the turning off of the 'enter serdes gate' trigger and the turning off of the 'enter serdes' trigger is 'S register restore' time. The character is now in the 1B-register; the S-register has been restored and is ready to accept the next character.

Because this is the first character sent, a Ⓓ is in the 1B-register. The Ⓓ character is detected (IOP 2-C6) and the 2740 goes into receive mode. The mode change resets the Ⓓ from the registers.

Receive Text Characters

- Text characters are received up to the 1B-register the same as control characters.
- Text characters transfer to the 2B-register.
- Characters are checked to determine whether they are function or print characters, and are gated to the appropriate circuit.

The 2740 is now in receive mode. The Ⓓ character has been reset from the 2740 registers and the terminal is ready to receive the first text character. The first text character arrives on the 'serial data in' line, is shifted down through the S-register, and transferred to the 1B-register (the same as was the Ⓓ character). When the character is in the 1B-register, the '1B full line' comes up. If (1) 2B is empty, (2) the character in 1B is a valid character, and (3) 2B is not resetting (main conditions), the '2B set' trigger turns on (IOP 2-A5). '2B set' transfers the character from the 1B-register to the 2B-register.

The output of the 2B-register inputs to both the print-decode and function-decode circuits (IOP 2-A6). At this point, the character is checked to see if it is a print or function character. The appropriate circuit is then gated by either the 'print' or 'non print function.' To transfer the character to the gated circuit, the 'print out' line must come up. When the character transferred to the 2B-register, the '2B full' line came up. '2B full' and 'not I/O cycle' bring up the 'print out' line, decoding the character and transferring it to the gated print or function circuit.

Once the character has started the operation of the I/O device, the 2B-register is reset in preparation for receipt of the next character. The condition of the I/O device is indicated by the 'I/O cycle' latch. The 'I/O N/O' line from the I/O device turns on the 'I/O cycle' latch (IOP 2-D3). '2B full,' 'not 2B reset gate,' and the 'I/O cycle' latch turn on the '2BR' trigger. The '2BR' output conditions one leg of an AND to the '2B reset' line (IOP 2-B5) and, with 'I/O cycle,' provides a gate to turn on the '2B reset gate' trigger (IOP 2-D5). The '2B reset gate' output completes conditioning the AND, causing 2B to reset. The '2BR' trigger turns itself off at the next 'CC2' pulse.

Receive End-of-Transmission Character Ⓒ

- Receipt of Ⓒ character causes 2740 to go into control-receive mode.
- Ⓒ character is detected in the 1B-register.

At the end of the message, the EOT character Ⓒ is received. The Ⓒ character causes the receiving 2740 to go into control-receive mode.

The Ⓒ character is received in exactly the same manner as the Ⓓ character. When the Ⓒ character is in the 1B-register, it is detected (IOP 2-C6), and the terminal goes into control-receive mode. The mode change does not occur until the operation of the previously received character is completed. The mode change brings up 'mode change,' which resets the Ⓒ character from the terminal registers. The terminal is now free to send or receive data.

2B Overflow Reset

- Detects characters being received at an excessive rate.
- Resets the 2B-register.
- The character in 2B is lost.

Characters can arrive at the 2740 at a faster rate than it can accommodate them. In this error condition, the 2B-register is reset and the character is lost. The excessive line rate activates the overflow-reset circuit.

'Overflow reset' comes up when characters are in the 1B- and 2B-registers ('1B full,' '2B full') and a character has shifted down through the S-register to the point that the 'S1' trigger is turned off by the start bit. 'SD1,' 'SD2,' SD3,' and 'not 2B set' complete conditioning an AND (IOP 2-D6) to develop the 2B overflow reset. '2B overflow reset' resets the 2B-register by bringing up both the '2BR' and '2B reset gate' triggers, developing '2B reset.'

POWER-ON RESET

- The terminal is reset when power comes up.
- Power supply relay (K1) provides the power-on reset.
- The terminal is also reset if 'data set ready' drops.

When power comes up, the 2740 goes into control-receive mode. This requires that most triggers and all registers be reset. The reset state can be either off or on, depending upon circuit requirements. The triggers and registers are reset either directly by the 'power on reset' line or, following the mode change, by the 'mode change' line.

When the Off-On switch is turned on, ac power is applied to the dc power supply (Figure 3-6). At the same time, ac power is supplied to relay K1. The dc power is present some milliseconds before the pick of K1 is completed. Power-on reset occurs during this time.

The K1-3 operating point is connected to ground. The N/C point goes to a converter. As soon as dc power comes up, the output of the converter brings up the 'power on reset -X' line, conditioning the OR to the 'power on reset' line. When the pick of K1 is completed, the 'power on reset -X' line drops, completing power-on reset.

'Power on reset' also turns on the 'mode change' trigger, bringing up 'mode change.' Between 'power on reset' and 'mode change,' the terminal triggers and registers reset; the terminal goes into control-receive mode, ready to start sending or receiving. As shown in Figure 3-6 , lack of 'data set ready' causes a power-on reset. If the terminal has the dial-up feature, loss of carrier causes a power-on reset.

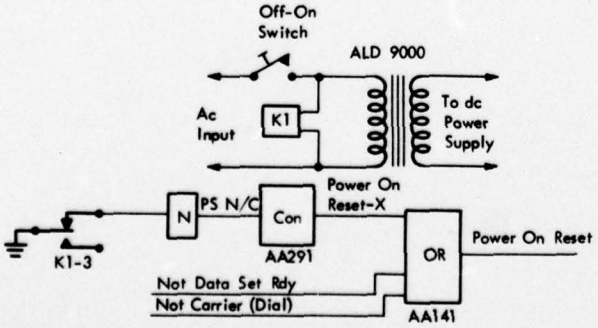


Figure 3-6. Power-On Reset

I/O MOTOR CONTROL

- In communicate mode, the I/O motor runs only when the terminal can send or receive text characters.
- The I/O motor runs continuously in local mode.

In control-receive mode, the terminal must be ready to receive information without operator assistance. In this mode, the I/O device can be inactive for several hours at a time. The I/O motor should not run during these standby periods because of the unnecessary heat and wear that result. The circuit shown in Figure 3-7 controls the motor contactor and provides for the several conditions under which the I/O motor must turn on. If any of the input conditions to the OR are met, the I/O motor turns on. The conditions to run the I/O motor (for the basic terminal) are:

1. 'Not comm' -- runs motor when the terminal is in local mode.
2. 'Not A' or 'not B' -- runs motor when the terminal is in any mode but control-receive.
3. 'Initial lowercase' and 'I/O cycle' -- allow the I/O device to be shifted if, when first turned on, it is in uppercase. ('I/O cycle' acts as an overlap to keep the motor running until the shift is complete.)

KEYBOARD LOCK

- Locks keyboard to prevent unintentional pressing of keys.
- Locks keyboard during carrier-return, tab, receive mode, control-character generation, and for one second at beginning of transmit mode.

The keyboard-lock circuit prevents operation of the I/O keyboard during the times when an error results if a key is unintentionally pressed. These times are:

1. When a long function (carrier-return or tab operation) occurs.

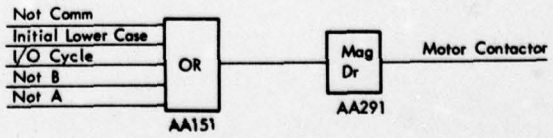


Figure 3-7. I/O Motor Control

2. When the terminal first goes into transmit mode. A 1-second delay prevents operation of the keyboard until the motor comes up to speed.
3. When the terminal is in receive mode.
4. When a control character is generated.
5. When the line adapter cannot accept data.

The logic needed to generate keyboard lock during these conditions is shown in Figure 3-8. The keyboard is locked for a carrier return or tab by the 'long function' line. This line inputs to 'OR 1.' 'OR 1' can also be conditioned by the output of an AND. One condition to the AND is the 'not local' line. 'Not local' holds the AND deconditioned when the terminal is in local mode, thus holding the keyboard unlocked. The other leg of the AND is from 'OR 2.' 'OR 2' can be conditioned by the output from the 'time-out 1' latch, '1B generate,' ' Ⓒ ,' or 'not send.' The 'time-out 1' latch inserts a 1-second delay before unlocking the keyboard when the terminal goes into transmit mode. When the 'B' trigger goes off, an AND is conditioned to the input of a 1-second delay. The output of the delay goes to an AND that turns on the 'time-out 1' latch. One second after the 'B mode' trigger turns off, the 'time-out 1' latch turns on. During this one second, the keyboard remains locked.

Whenever a control character is to be sent, the '1B generate' line comes up. During the time that '1B generate' is up, the keyboard remains locked. If the control character is a Ⓒ , the keyboard must be locked until the terminal returns to control-receive mode. '1B generate' and ' Ⓒ ' immediately lock and keep the keyboard locked until the mode change is completed.

When the terminal is in receive mode, the keyboard is held locked by the 'not send' line.

If the line adapter (data set or modem) cannot accept data, the 'not clear to send' line keeps the keyboard locked.

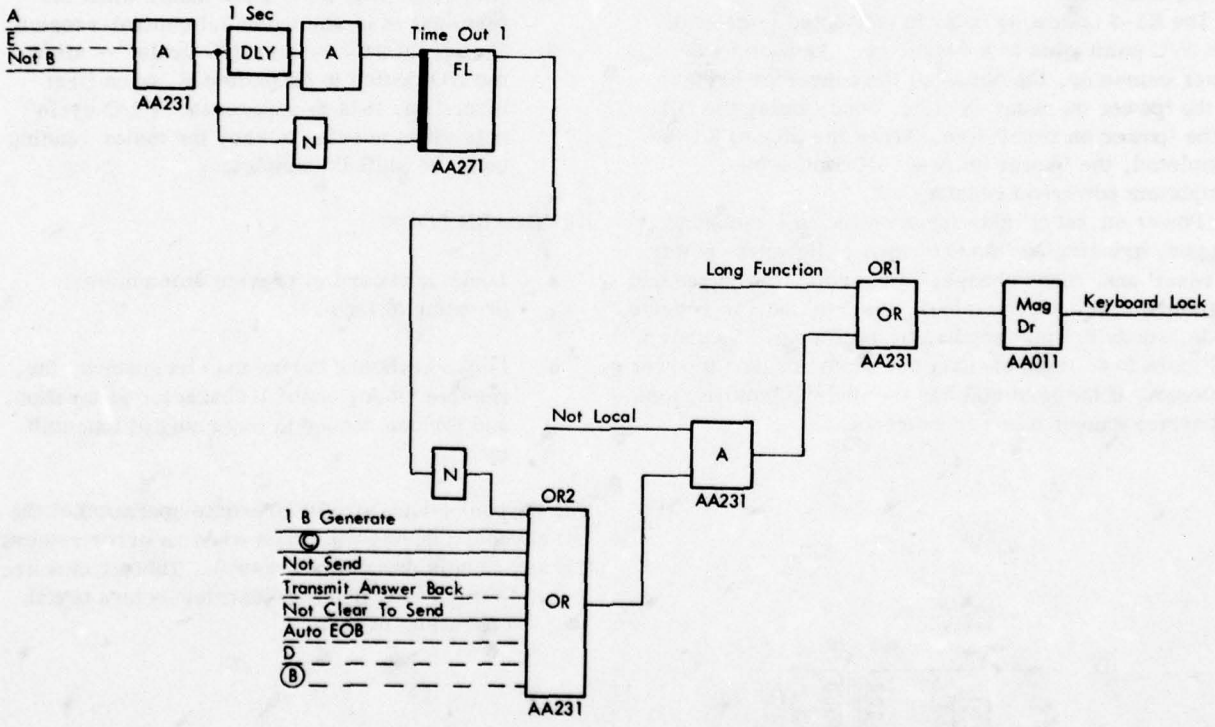


Figure 3-8. Keyboard Lock

INITIAL LOWERCASE

- Causes the I/O device to shift to lowercase, when in control-receive mode.

This circuit insures that the I/O device begins each operation in lowercase. The I/O shift mechanism is designed for both manual and electrical operation. Either the keyboard shift-lock or the latching of the shift magnets can lock the I/O device in uppercase. The initial lowercase circuit will shift the I/O device to lowercase for either condition.

The keyboard shift-trip mechanism in the I/O device is operated by the logic shown in Figure 3-9. When an uppercase condition exists during control-receive mode, the 'initial lowercase' flip latch turns on and conditions the shift-trip magnet driver. The shift-trip magnet moves the keyboard shift-lock pawl from its keeper. During the shift-down operation, the flip latch holds the pulse on the magnet until the I/O device returns to lowercase. When it does, the 'UC1' signal deconditions the flip latch and the pulse is removed from the magnet.

If the I/O device is latched in uppercase by the shift-magnet armature latch, the above operation does not restore the I/O device to lowercase. The I/O device must be shifted to lowercase by pulsing the shift magnet. 'Initial lowercase' inputs to an OR to the shift-magnet driver. With 'initial lowercase' conditioned, the shift-magnet driver is conditioned and the lowercase magnet is picked.

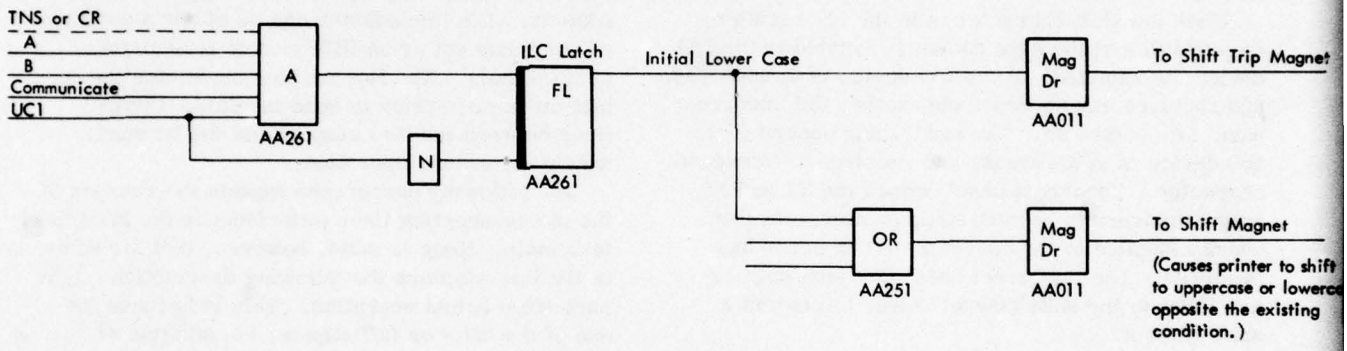


Figure 3-9. Initial Lowercase

INCORRECT CASE

- If the I/O device is in the same shift as the received shift character, 'incorrect case' comes up.

- 'Incorrect case' causes a hyphen to be printed.

When the sending terminal sends an uppercase or lowercase shift character, the receiving terminal shifts into the desired case. However, the terminal might already be in the desired case. If this occurs, the previously sent characters might have been printed in the wrong case. The operator must be notified, therefore, that an error has occurred. Figure 3-10 shows the circuit used to indicate this error.

When the shift character is in the 2B-register, the condition of the case contacts, located in the I/O device, is sampled. If the I/O device is in uppercase and receives an uppercase character, the 'incorrect case' line comes up. The same thing occurs if the I/O device is in lowercase and receives a lowercase character. 'Incorrect case' causes the T1 and R5 magnet drivers to be activated, printing a hyphen, which indicates to the operator that an error has occurred. The 'incorrect case' line also degates the ANDs to the shift magnet driver to prevent a shift attempt.

If the terminal is equipped with the record-checking feature, 'incorrect case' also turns on the 'error' trigger. When the receiving terminal performs an EOB-check, the condition of the 'error' trigger informs the sending terminal of the error.

TERMINAL TO LINE-ADAPTER INTERFACE

- Line adpaters connect terminals to communication lines.

- The connections between the line adapter and the terminal form the interface.

Because dc voltage is used by the 2740/2741 terminal, data cannot be sent directly to another terminal. The bits making up a character must be changed to another form for transmission. This conversion is accomplished by connecting the terminal output to a line adapter. The line adapter can be either a common-carrier data set or an IBM modem (modulator-demodulator). The line adapter modulates the dc bits on an ac carrier to send the data. Control lines between the line adapter and the terminal synchronize their operation.

The following paragraphs explain the function of the interconnecting lines (interface) in the 2740/2741 terminals. Keep in mind, however, that for some of the line adapters the following description might vary from actual operation. This is because the use of the half- or full-duplex, the addition of special features, and/or the operation of the terminal with a multiplexer cause different timing considerations.

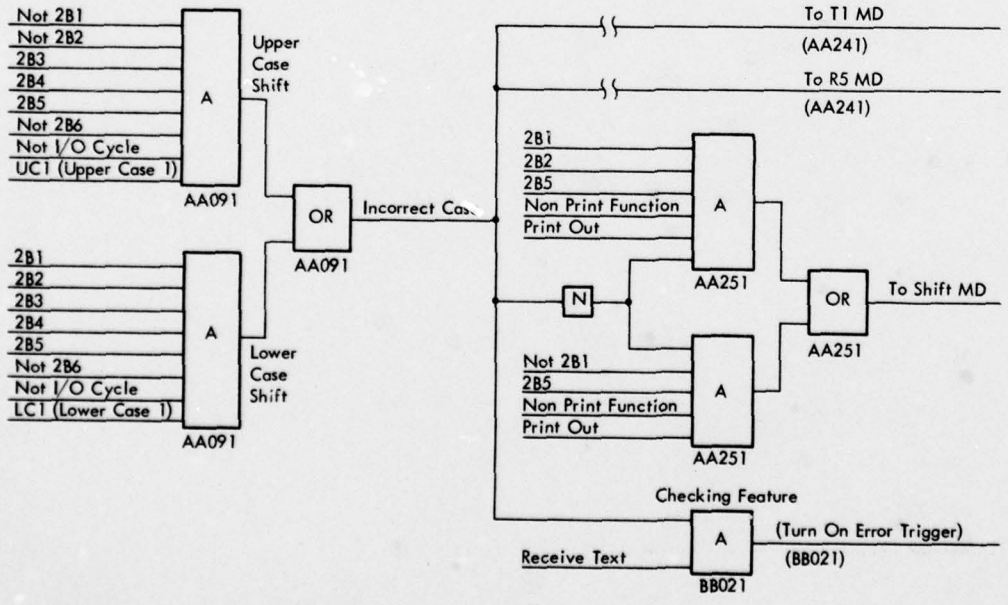


Figure 3-10. Incorrect Case

Signal Ground-AB

This line serves as the signal voltage reference between the line adapter and the terminal.

Transmitted Data (Serial Data Out)-BA (Figure 3-11)

This is the data-out line from the terminal to the line adapter. Data generated in the terminal is sent out on this line.

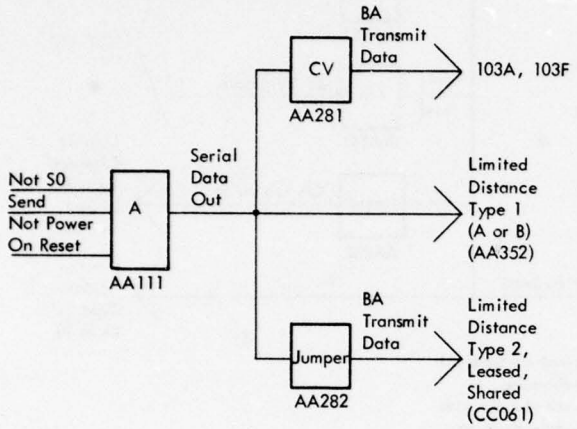


Figure 3-11. Serial Data Out (Transmitted Data)

Received Data (Serial Data In) -BB (Figure 3-12)

This is the data-in line from the line adapter to the terminal. Data received by the terminal arrives on this line.

Data Set Ready-CC (Figure 3-13)

This line from the line adapter indicates to the terminal that the line adapter has power and can communicate.

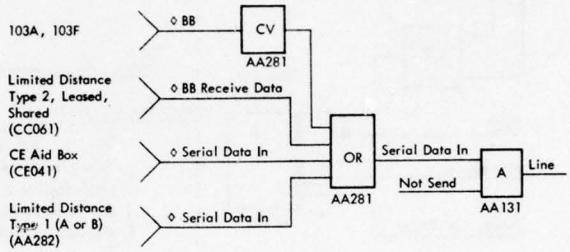


Figure 3-12. Serial Data In (Received Data)

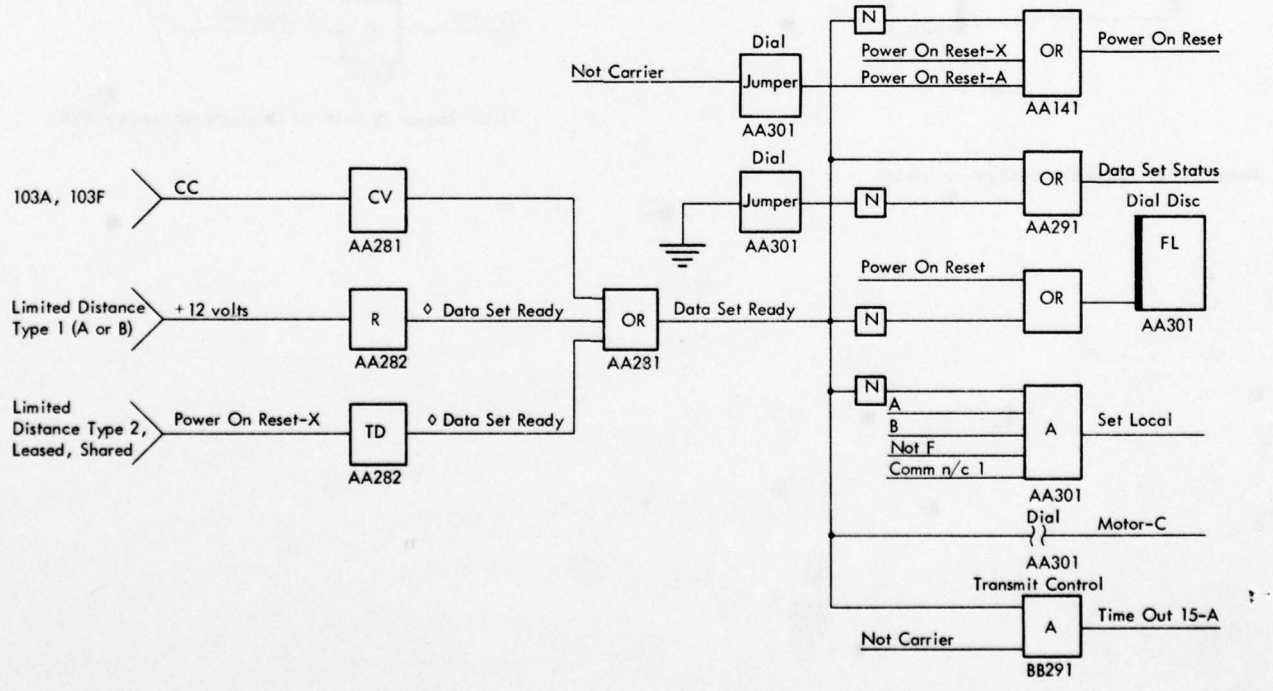


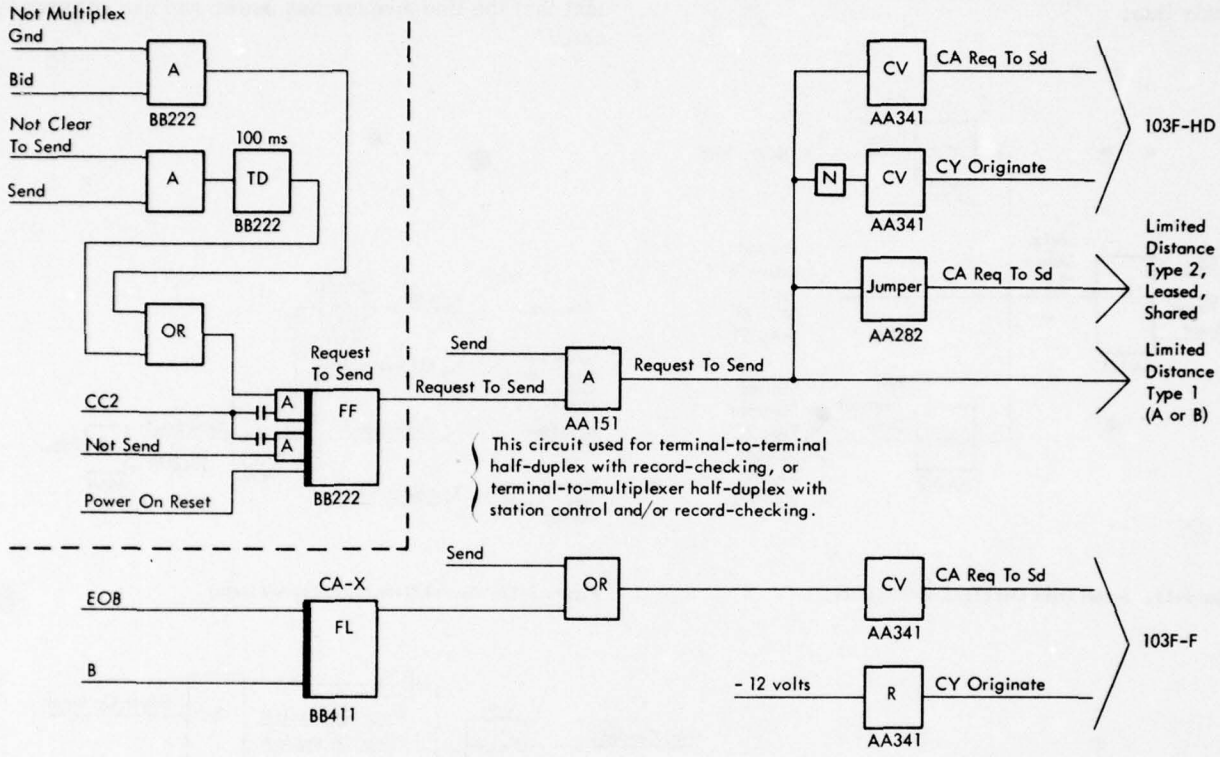
Figure 3-13. Data Set Ready

Request To Send-CA (Figure 3-14)

This line from the terminal tells the line adapter that the terminal is prepared to send data. In the line adapter, this line usually generates the carrier frequency.

Clear To Send-CB (Figure 3-15)

This line is the line adapter's answer to 'request to send.' When the line adapter is in a condition to send data, 'clear to send' comes up to allow the terminal to begin sending.



Note: Request To Send and Originate not used by 103A.

Figure 3-14. Request to Send and Originate

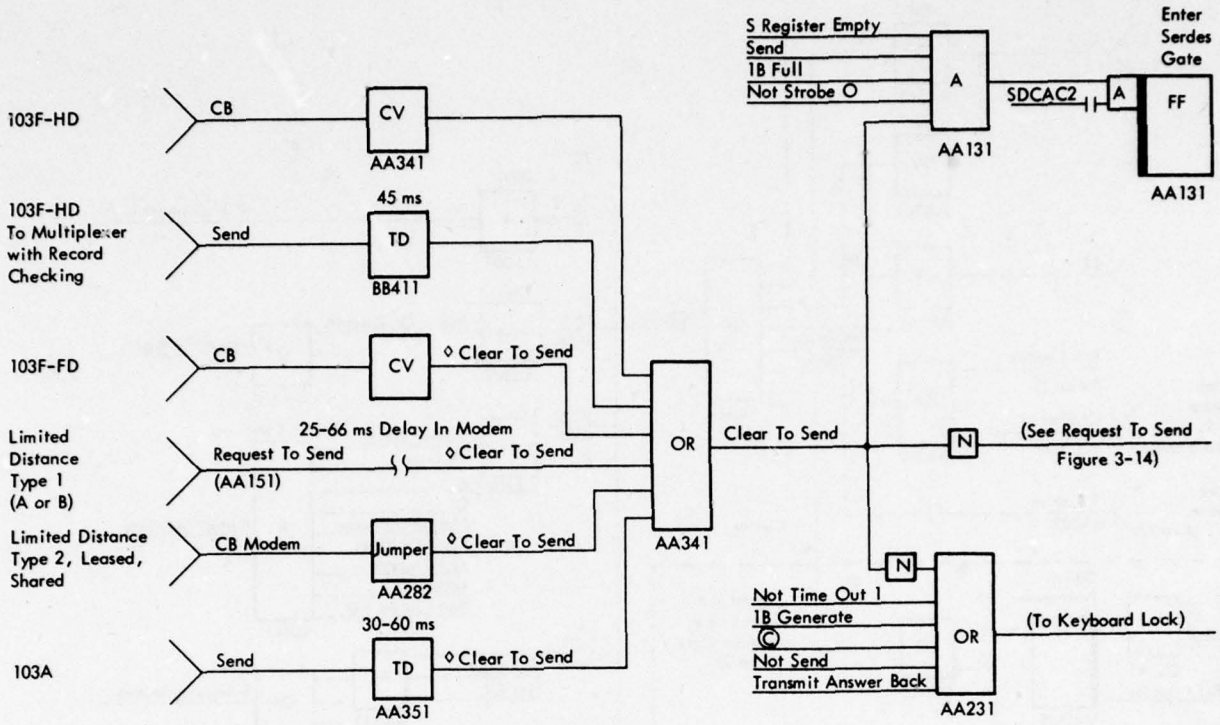
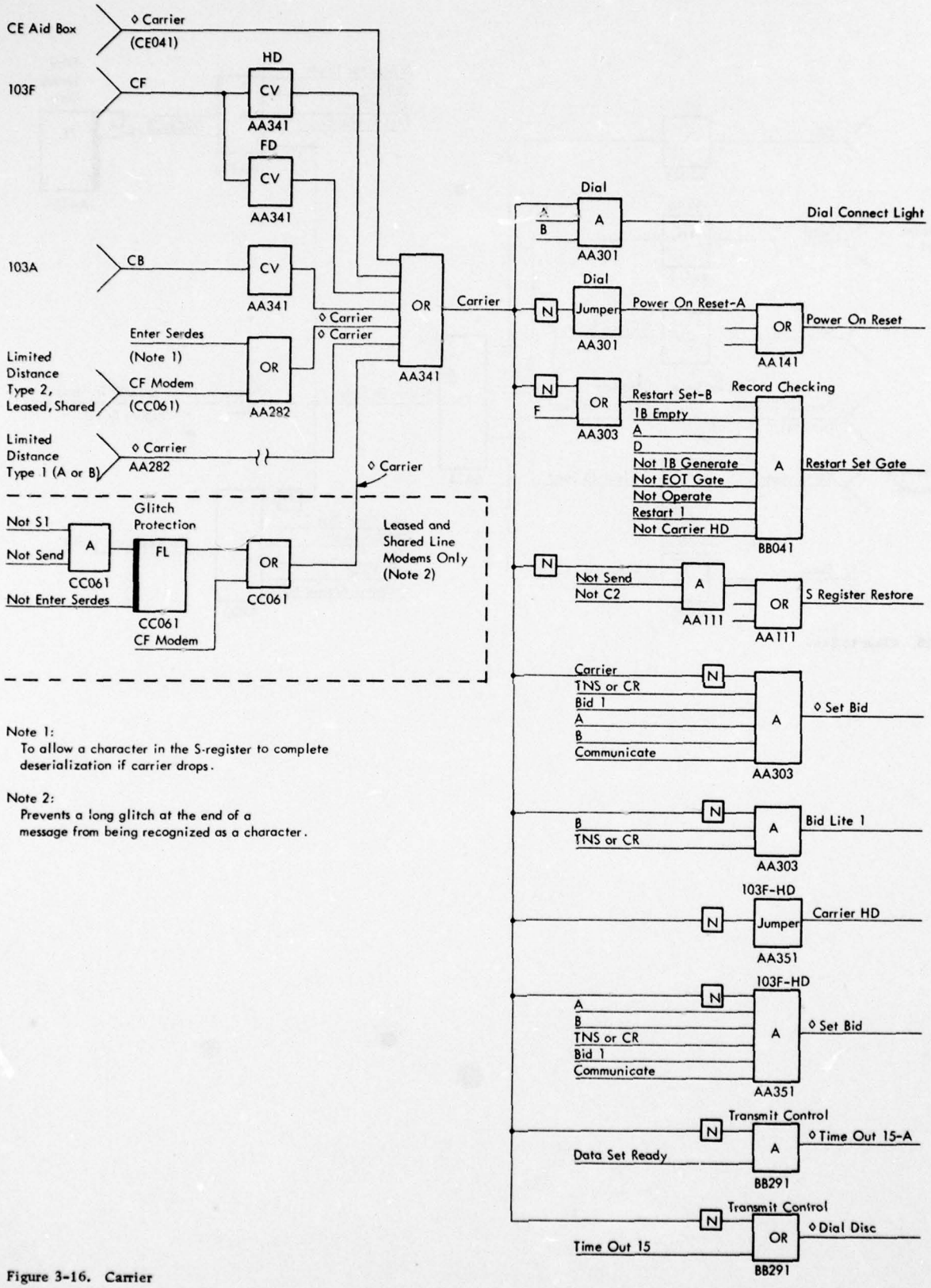


Figure 3-15. Clear to Send



Note 1:
To allow a character in the S-register to complete deserialization if carrier drops.

Note 2:
Prevents a long glitch at the end of a message from being recognized as a character.

Figure 3-16. Carrier

Carrier-CF (Figure 3-16)

This line comes up when 'carrier' from the sending line adapter is received and detected by the receiving line adapter. 'Carrier' coming up allows the terminal to receive data.

Originate (used only for 103 F data set)-CY (see Figure 3-14)

This line puts the 103 F data set into answer mode. For half-duplex operation, data sets on both ends of the line are in originate mode. In order to send data, one of the data sets must be put into answer mode. The 'originate' line serves this purpose. When 'request to send' is brought up in the terminal, the 'originate' line, normally held up, drops. For full-duplex operation, the 'originate' line is held down, keeping one set of communication lines in answer mode and the other in originate mode.

Data Terminal Ready (used only for 103A data set) - CD (Figure 3-17)

This line from the terminal to the line adapter controls the operation of the 103A data set. If the line is up (indicating that the terminal has status and the Dial-Disconnect key has not been pressed), the dial connection is maintained; if the line drops, a dial disconnect begins.

2741 COMMUNICATION TERMINAL

- Basic 2741 sending and receiving circuits are the same as in the 2740.
- Control-receive mode with the Local/Communicate switch at COMM causes the terminal to go into transmit-text mode and to send a Ⓓ .
- Pressing either the Carrier-Return or Attention key causes the terminal to send a Ⓒ and to go into receive-control mode.
- In receive-control mode, receipt of a Ⓒ puts the terminal into transmit-text mode; receipt of a Ⓓ puts the terminal into receive-text mode.

The 2741 Communication Terminal is designed to be used only with a computer. The terminal operates point-to-point with the computer multiplexer.

The 2741 keyboard does not use the same control keys as the 2740. The only difference between the 2741 keyboard and a standard SELECTRIC keyboard is the Attention key, which replaces the Index key. The standard character code used by the 2741 is correspondence code, although BCD code is available.

The basic 2741 sending and receiving circuits are identical to those of the 2740. The Ⓓ and Ⓒ control characters, however, are used differently by the 2741. As in the 2740, operations are controlled by the terminal modes: control-receive, transmit-text, receive-text, and receive-control.

Operation starts when the terminal is turned on. (Figure 3-18). As in the 2740, a power-on reset places the 2741 into control-receive mode. When the terminal is in control-receive mode, the 'bid' trigger turns on, loading a Ⓓ into 1B and placing the terminal into transmit-text mode. The Ⓓ is sent

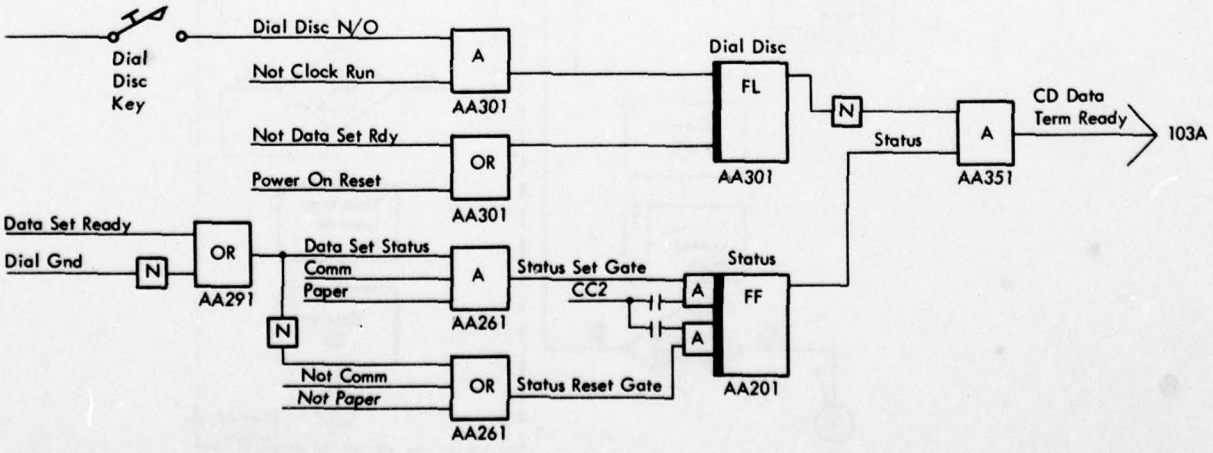


Figure 3-17. Data Terminal Ready

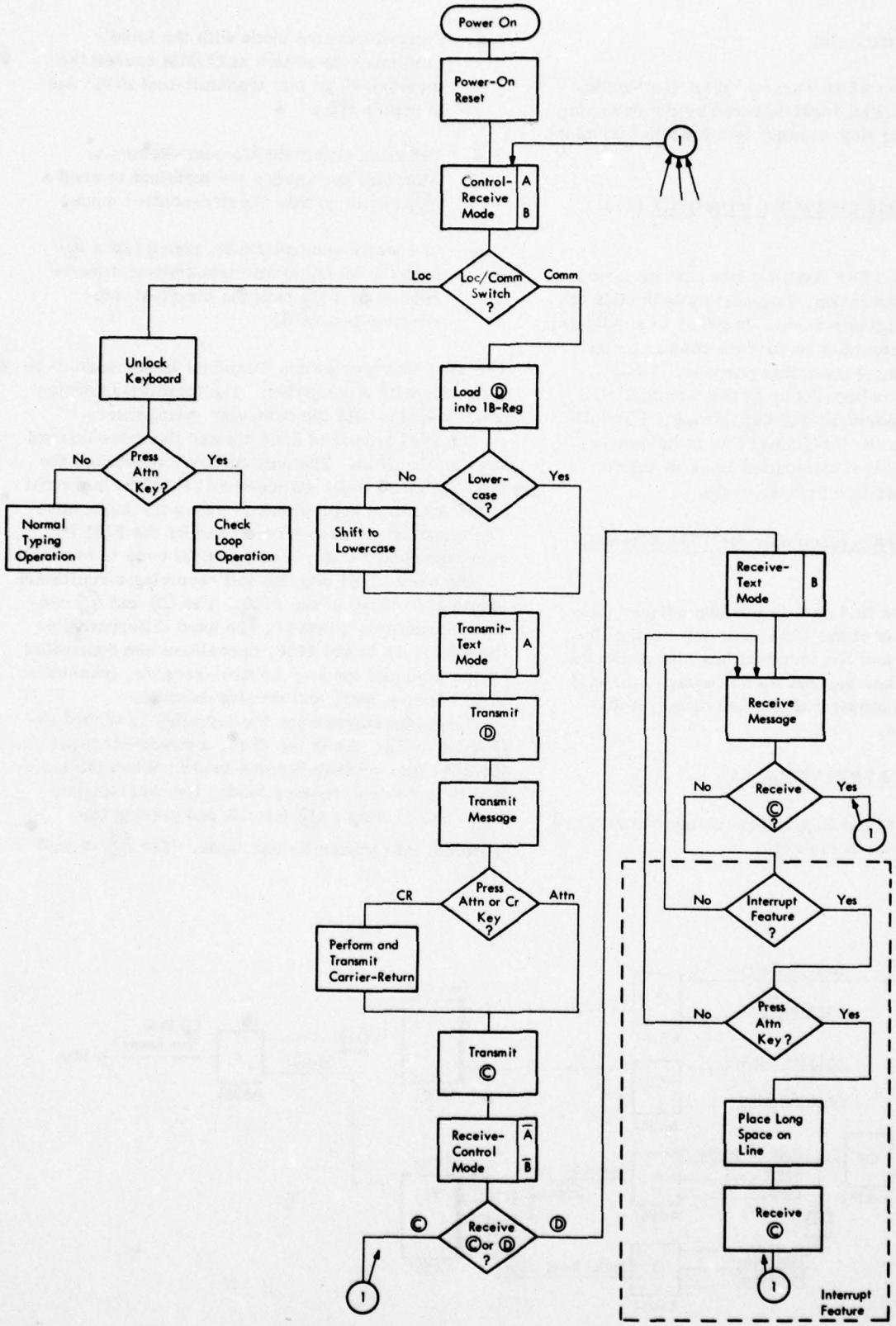


Figure 3-18. 2741 with interrupt Flowchart

to the multiplexer and informs the multiplexer that the terminal is on-line and in transmit-text mode. The 2741 operator can send data until he presses the Attention key or the Carrier-Return key. A Ⓒ is then sent to the multiplexer, and the terminal goes into receive-control mode.

In receive-control mode, the terminal can receive either a Ⓓ or a Ⓒ. If a Ⓓ is received, the terminal goes into receive-text mode, and the multiplexer sends its message. If a Ⓒ is received, the terminal first goes into control-receive mode, loading a Ⓓ into 1B; and then to transmit-text mode, sending the Ⓓ. The operator can now send a message. As before, after sending a Ⓒ, the terminal goes into receive-control mode.

The primary objective of the following operation is to recognize the control character and then to change the terminal mode.

When (1) the terminal is in control-receive mode, (2) the terminal is shifted to lowercase, (3) no operation is taking place, and (4) the Local/Communicate switch is at COMM, the 'bid' trigger turns on (IOP 3-A3). The 'bid' trigger operates exactly as in the 2740 terminal, bringing up '1B generate,' which loads a Ⓓ character into the 1B-register. The 'B reset gate' comes up to place the terminal into transmit-text mode and to send the Ⓓ. A message can now be sent in exactly the same manner as with the 2740.

When the operator presses the Carrier-Return or the Attention key, the 'EOT' trigger turns on (IOP 3-C4). If the operator presses the Attention key, 'Attn 1' (Attention key N/O contacts) and the other conditions to 'AND 1' turn on the 'EOT'trigger. If the operator presses the Carrier-Return key, the carrier-return character is loaded into the 1B-register in the normal manner. The carrier-return code is recognized by 'AND 2' and (with 'send,' 'enter serdes,' and 'C1') turns on the 'auto EOT' trigger. 'Auto EOT' and 'not operate' turn on the EOT trigger when the carrier-return is completed. The 'EOT' trigger operates exactly as in the 2740, bringing up '1B generate,' which loads a Ⓒ into the 1B-register.

Because the Shift key is not interlocked with any other key, the Carrier-Return key and the Shift key can be pressed at the same time. This causes the 1B-register to be loaded with an error character. To ensure that the carrier-return character is generated and sent properly, the 'CR' latch turns on when the carrier-return contact (C6 N/O) makes. The 'CR' latch prevents the loading of bits into 1B-register positions 1B2 and 1B5. When '1B generate' comes up to load the Ⓒ character into 1B, the 'CR' latch turns off. The Ⓒ is detected and brings up 'A reset gate' (placing the terminal in receive-control mode), and turns off the 'auto EOT' trigger.

In receive-control mode, the terminal can receive either a Ⓓ or a Ⓒ character. If a Ⓒ is received, the A and B set gates are brought up by 'not send,' 'not operate,' and 'Ⓒ,' putting the terminal into control-receive mode. A Ⓓ is loaded into 1B, and the mode changes to transmit-text. The Ⓓ is then sent.

If a Ⓓ is received, the terminal goes into receive-text mode. The 'B set gate' is brought up by 'not send,' 'not B,' and 'Ⓓ.' The multiplexer then sends its message and, when the message is completed, sends a Ⓒ. If the Communicate/Local switch is turned to LOCAL during any mode, the terminal returns to control-receive mode by bringing up the A and B set gates.

SECTION 1. RECORD-CHECKING (2740)

INTRODUCTION

- Data is checked vertically and longitudinally.
- Parity errors (VRC) are indicated by a hyphen printed at the receiving terminal.
- Sending terminal starts the EOB-check.
- Response to EOB-check indicates accuracy of reception.

Record-checking is a method whereby the great majority of sending and receiving errors are detected. Each character received is checked vertically for odd parity (vertical redundancy check); the entire message is checked longitudinally by maintaining an odd-even count of each bit position as the characters are sent (longitudinal redundancy check). This latter count (LRC) is maintained at each terminal. The receiving terminal's response to periodic sending-terminal inquires indicates the accuracy of data received.

Vertical Redundancy Check (VRC)

VRC uses the odd-bit count of each character received to test the accuracy of received data. If the bit count of a character is even, the gain or loss of a bit indicates a wrong character; a hyphen is printed at the receiving terminal to alert the operator that an error has occurred. Furthermore, an error trigger within the terminal turns on to later advise the sending terminal that an error has occurred.

Longitudinal Redundancy Check (LRC)

LRC uses an odd-even count of bits in each bit position to develop a 7-bit LRC-character. This character is developed in the sending terminal during transmission. The receiving terminal also develops an LRC-character at the same time.

The presence of a bit within the LRC-character indicates that an odd number of bits has been sent in that position; the absence of a bit indicates an even number of bits has been sent. Because the same data generates the LRC-character at both terminals, the characters should be identical. No comparison between the LRC-characters is made, however, and no LRC-error can be recognized until an end-of-block check is made.

End-of-Block (EOB)

During the sending operation, the sending terminal receives no indication of errors received at the receiving terminal. Periodically, the sending terminal operator checks the receiving terminal for accuracy of reception. This check is accomplished by pressing the EOB key on the I/O keyboard. Pressing the EOB key automatically compares the LRC-characters developed at each terminal and checks the 'error' trigger at the receiving terminal. Any terminal error is then indicated by printing a hyphen at the sending terminal.

Data Flow

When a block of information is checked, the sending terminal operator performs an EOB-operation. A (B) character, followed by the LRC-character, is sent to the receiving terminal. The LRC-characters are then compared to determine whether a longitudinal error has occurred.

The sending of the (B) character places the sending terminal into transmit-LRC mode. In transmit-LRC mode, the terminal sends the LRC-character, after which the sending terminal goes into receive-check/answerback mode. In this mode, the Receive light, Lock light, and motor are on; and the terminal waits for an answer from the receiving terminal.

The receiving terminal, upon reception of the (B) character, goes into receive-LRC mode. This mode conditions the receiving terminal circuits to recognize the next character as an LRC-character. The motor and the Receive light are on, and the parity-error circuit is inhibited. The circuit is inhibited because the LRC-character can correctly have either an odd or even bit count. Reception of the LRC-character places the receiving terminal into transmit-check/answerback mode. In this mode, the received LRC-character is compared with the LRC-character developed within the receiving terminal. If the characters do not compare, the 'error' trigger turns on, and a hyphen is printed at the receiving terminal.

The condition of the 'error' trigger also determines the response that is returned to the sending terminal. With the 'error' trigger on, a (N) negative response is sent; with the 'error trigger off, a (Y) positive response is sent. In either case, the receiving terminal

returns to receive-text mode.

The sending terminal, meanwhile, is in receive-check/answerback mode. If a Ⓨ is received, the terminal returns to transmit-text mode and transmission continues. If a code other than a Ⓨ is received, the terminal prints a hyphen, rings the alarm bell, and shifts to transmit-text/lock mode. In this mode, the keyboard is locked and the Transmit light, Lock light, and motor are on. The lock condition exists until either an EOT or restart operation is performed at the sending terminal. The restart operation returns the terminal to transmit-text mode. The EOT operation sends a Ⓒ and places the terminal into control-receive mode.

FUNCTIONAL UNITS

Parity Error (VRC)

- The 'parity error' trigger is first turned on by the start bit.
- Each data bit changes the state of the 'parity error' trigger.
- Stop bits are not checked.
- The 'parity error' trigger on at the end of a character indicates a parity error.
- A parity error turns on the 'parity error or not S8' latch.

The parity-error circuit is used only in receive mode. The 'parity error' trigger first turns on when the start bit arrives. Each succeeding data bit turns the 'parity error' trigger on or off. When a complete in-parity character is received, the 'parity error' trigger is off. When a character containing a parity error is received, the 'parity error' trigger is on.

The input to the parity-error circuit is the output of the 'S register' trigger, 'S8.' 'AND 1' (Figure 4-1) is conditioned by 'S8,' 'not send,' the 'parity error' trigger off, and 'not L' ('not L' disables the parity-error circuit when the LRC-character is received). 'AND 2' is conditioned by 'S8,' 'not send,' and the 'parity error' trigger on. If the 'parity error' trigger is off, it is turned on by the next bit; if the 'parity error' trigger is on, it is turned off by the next bit.

The parity check starts when the start bit is received by the S-register. Because the 'parity error' trigger is first turned off by 'S register restore,' the receipt of the start bit turns the 'parity error' trigger on. The 'parity error' trigger flips back and forth as the bits are received. If the received character is in parity, the 'parity error' trigger will be off at stop-bit time. The condition of the 'parity error' trigger is tested primarily by 'not S0.' 'Not S0' signals the terminal that the start bit of the character has been shifted to the 'S0' trigger and, therefore, that the complete character has been received. Because of this timing, the stop bit is not included in the parity check.

If the stop bit is absent from the character (usually caused by line trouble), the 'S8' trigger is off. Because the stop bit turns the 'S8' trigger on, the absence of a bit in 'S8' indicates loss of the stop bit. Either the 'parity error' trigger on or the absence of a stop bit turns on the 'parity error or not S8' latch. 'Parity error or not S8,' ANDed with 'not L' and 'receive text,' turns on the 'error' trigger. The 'error' trigger is tested during the EOB-operation.

Error Trigger

The 'error' trigger (Figure 4-1) informs the terminal logic whether one of the following errors has occurred:

1. An LRC-error
2. The absence of a stop bit
3. A parity error
4. A 2B overflow reset
5. Incorrect case

The condition of the 'error' trigger, when sampled, indicates an error to the terminal.

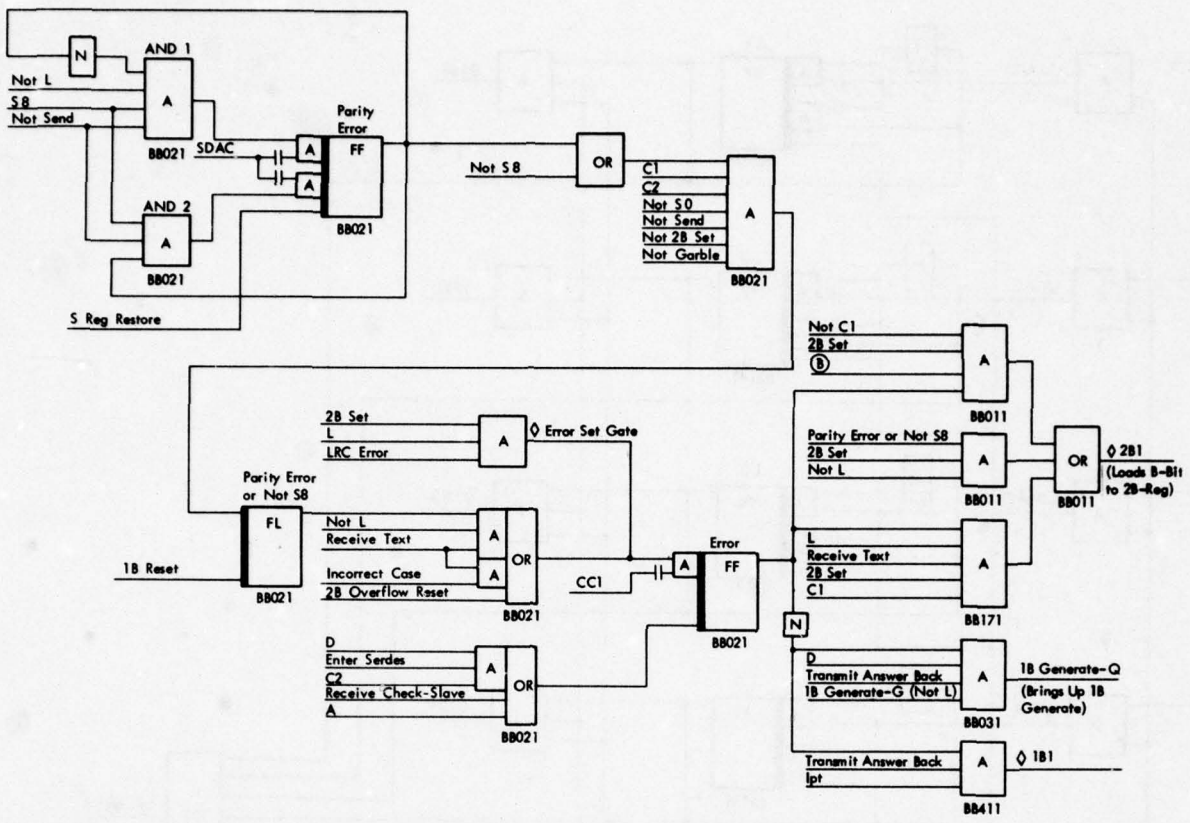


Figure 4-1. Parity and Not S8 Errors

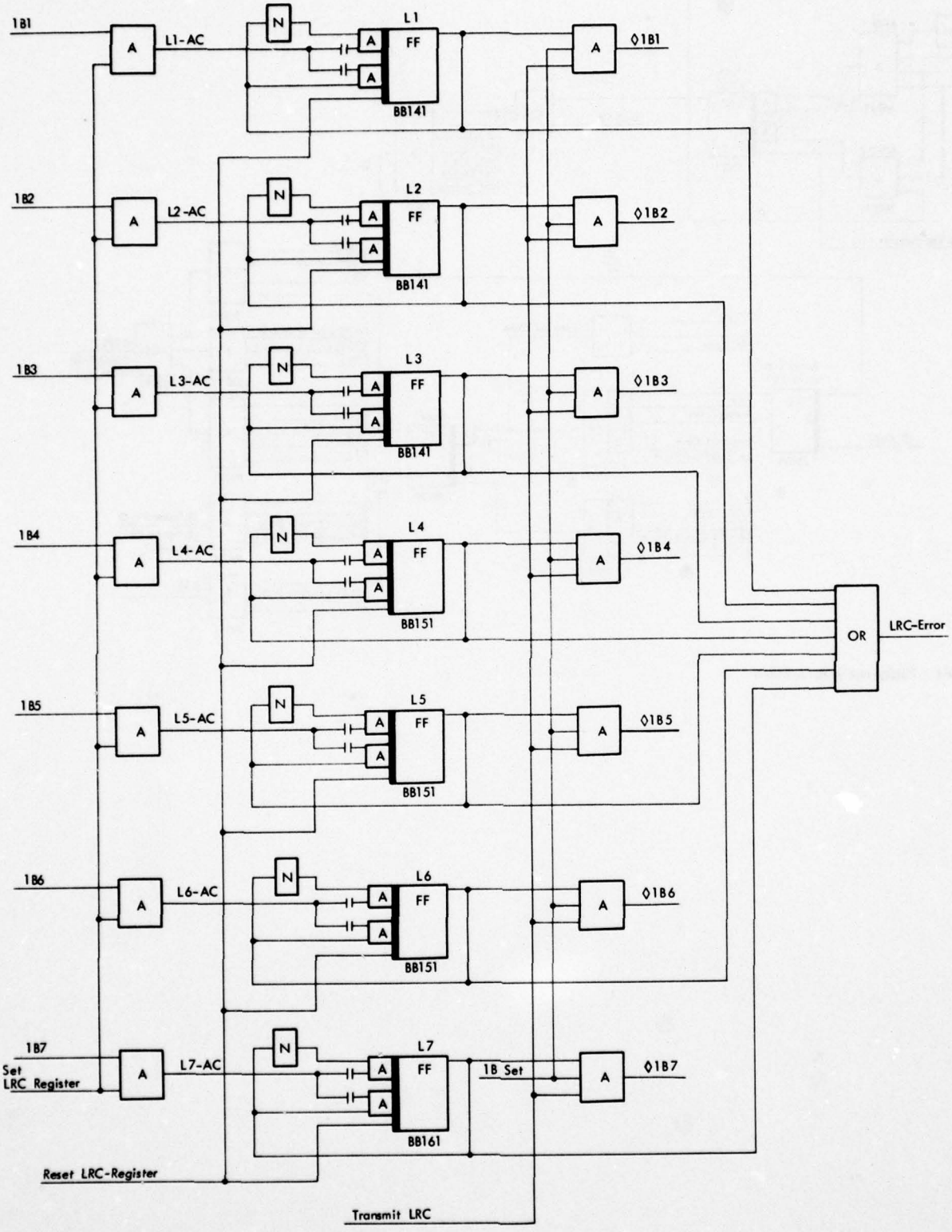


Figure 4-2. LRC-Register

LRC-Register

- The LRC-character is accumulated in the LRC-register.
- Characters enter the LRC-register from the 1B-register.
- All text characters and the Ⓑ character form the LRC-character.
- Comparing is accomplished when the transmitted LRC-character is entered into the LRC-register.
- If any LRC-register triggers are on after the comparison, an error is indicated.

The LRC-register consists of seven triggers (Figure 4-2), one for each data-bit position. The input to the LRC-register is from the 1B-register. Each LRC-register trigger is turned on or off by the incoming data bit. If the trigger is on, it turns off; if the trigger is off, it turns on. Thus, an account of each data-bit position is kept. Figure 4-3 shows the theory of LRC-register operation. Note that if an odd number of data bits input to an LRC-register trigger, the trigger is on for the check character; if the number of bits is even, the trigger is off.

In the sending terminal, the check character is accumulated and sent. In the receiving terminal, the check character is accumulated and compared with the one received from the sending terminal. To compare characters, the transmit LRC-character is entered into the LRC-register. All triggers that are on should turn off and none should turn on. If any triggers are left on, 'LRC error' comes up(see Figure 4-2).

Transmission Characters

LRC Latch	1		B		M		2		7		4		0		Generated LRC-Char
L1	B	↑	B	↓	B	↑									B
L2	A	↑	A	↓											
L3	8	↑											8	↓	
L4					4	↑			4	↓	4	↑			4
L5			2	↑			2	↓	2	↑			2	↓	
L6	1	↑							1	↓					
L7	C	↑			C	↓							C	↑	C

↑ Turn On LRC-Register Latch
↓ Turn Off LRC-Register Latch

Figure 4-3. LRC-Register Operation

Control of the LRC-register is shown in Figure 4-4. All characters sent or received while the terminal is in a "text" mode are entered into the LRC-register. In transmit-text mode, when 'enter serdes,' 'C1,' and 'time-out 1' are up, the 'set LRC' trigger turns on. 'Set LRC' gates the character from the 1B-register to the LRC-register. The 'set LRC' trigger then gates itself off. Another AND, conditioned by 'transmit text,' 'enter serdes,' 'C1,' and 'not Ⓓ,' also turns on the 'set LRC' trigger. 'Not Ⓓ' prevents the Ⓓ character from entering the LRC-register.

In receive-text mode, 'receive text,' 'C1,' and 'not 2B set,' turn on the 'set LRC' trigger. 'Set LRC' occurs at the same time as '1B set.'

The LRC-register is reset by the 'reset LRC' trigger. The trigger turns on when the 'L' mode trigger is off and the mode changes. The 'reset LRC' trigger then turns itself off. The 'L' trigger input allows the Ⓑ character to be set into the LRC-register.

Mode Triggers

- Three mode triggers are added for the record-checking feature.

The terminal mode determines the action the terminal performs. To enable the terminal to change to the additional modes needed for the record-checking feature, the 'D,' 'F,' and 'L' mode triggers are added. Figure 4-5 shows all the mode triggers used with the record-checking feature.

The terminal mode is determined by various combinations of mode triggers turning on. The chart at the bottom of Figure 4-5 defines the mode trigger/triggers that turn on for each mode. Control-receive, transmit-text, and receive-text modes are the same as for the basic terminal. Transmit-LRC mode causes the sending terminal to send the contents of the LRC-register (LRC-character) to the receiving terminal. Receive-LRC mode causes the receiving

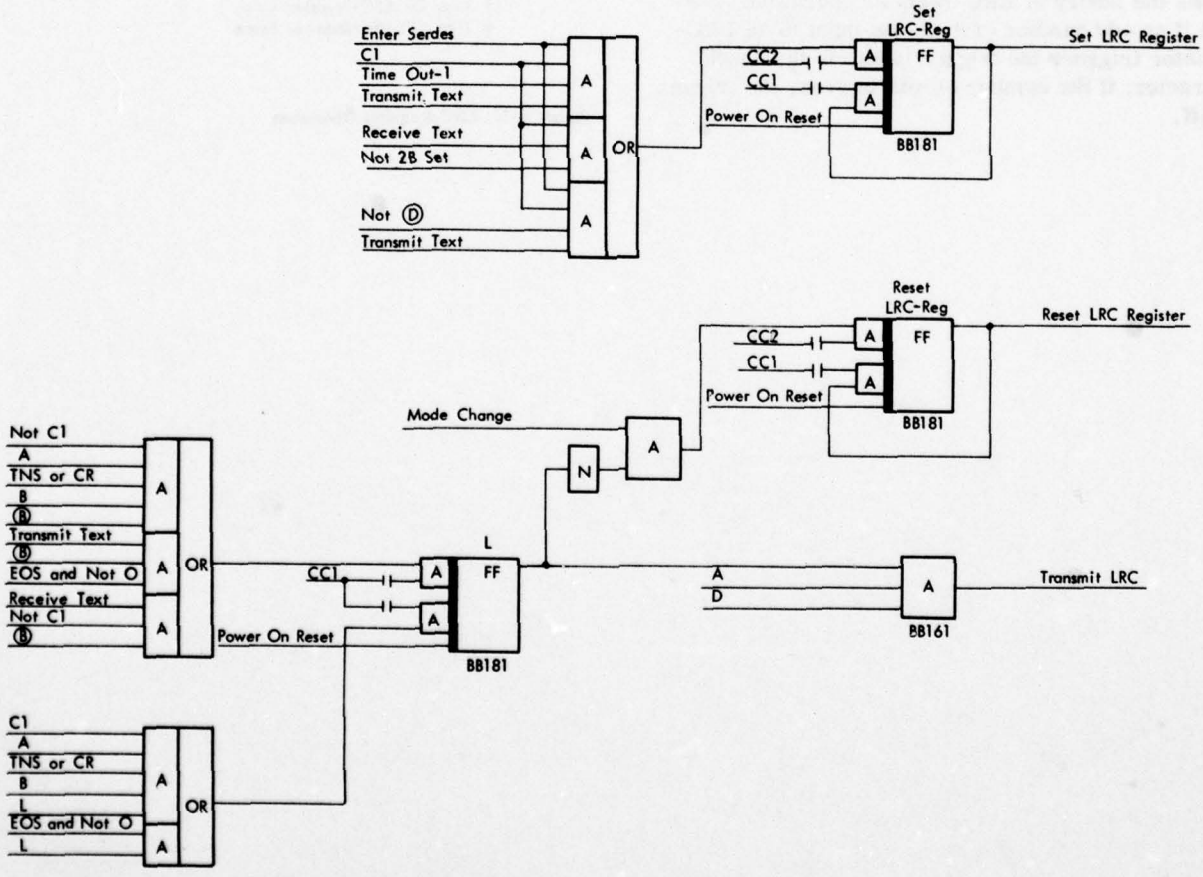


Figure 4-4. LRC-Register Control

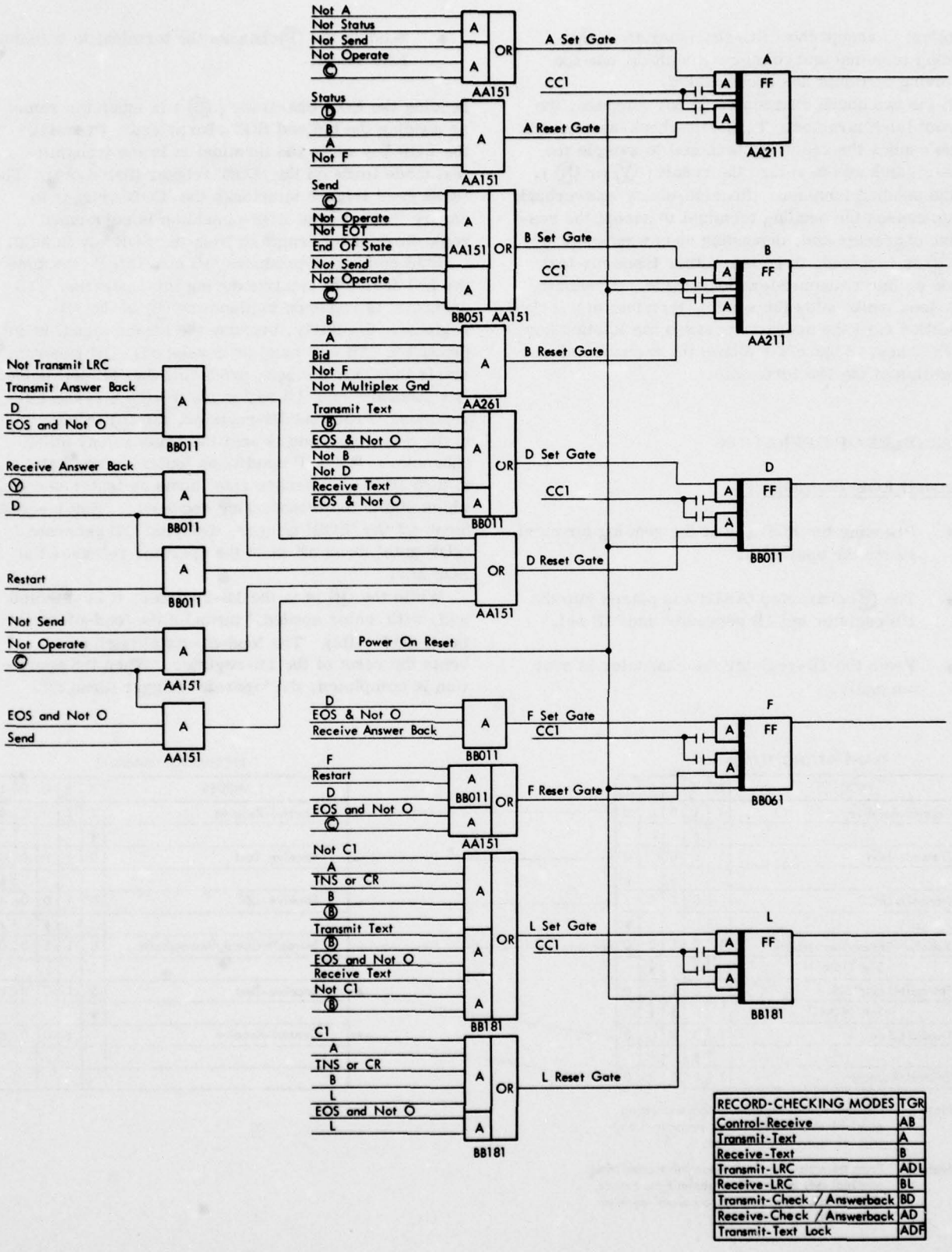


Figure 4-5. Mode Triggers, Record-Checking

terminal to accept the LRC-character from the sending terminal and compare it with the one the receiving terminal has accumulated.

If the two check characters do not compare, the 'error' latch turns on. Transmit-check/answerback mode causes the receiving terminal to sample the 'error' latch and to return the result (Ⓨ or Ⓝ). to the sending terminal. Receive-check/answerback mode causes the sending terminal to accept the response character and, depending upon whether a Ⓨ or Ⓝ is received, to go into either transmit-text mode or into transmit-text/lock mode. Transmit-text/lock mode holds the sending terminal in a locked condition until the operator presses the Restart key or EOT key. Figure 4-6 shows the sequence of operation of the two terminals.

PRINCIPLES OF OPERATION

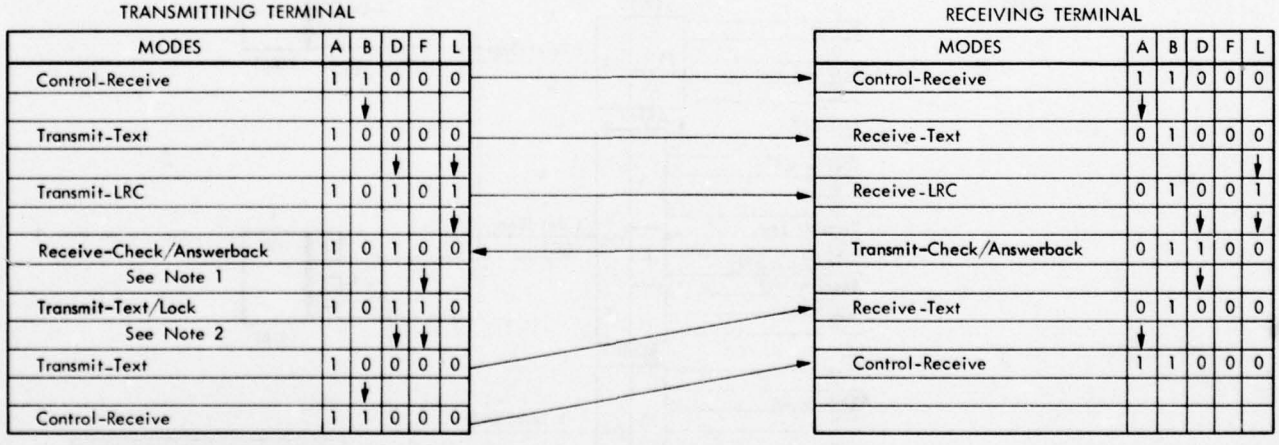
Transmit EOB-Character

- Pressing the EOB key at the sending terminal starts the operation.
- The Ⓑ character (A842C) is placed into the 1B-register by '1B generate' and '1B set.'
- From the 1B-register the character is sent normally.
- Sending the Ⓑ changes the terminal to transmit-LRC mode.

Sending the EOB-character (Ⓑ) is much the same as sending the bid and EOT characters. Pressing the EOB key while the terminal is in the transmit-text mode turns on the 'EOB' trigger (IOP 4-A1). The 'EOB gate' trigger interlocks the 'EOB' trigger to ensure that a single EOB-operation is performed regardless of the length of time the EOB key is held.

EOB coming on produces '1B generate.' Because the I/O device is inactive during this operation, '1B generate' is required to place the Ⓑ in the 1B-register. Similarly, because the strobe signal is not produced, '1B set' must be developed. '1B generate' starts the control clock, producing the '1B set' pulse. '1B generate' and '1B set' place the Ⓑ into the 1B-register. From the 1B-register, the Ⓑ transfers to the S-register and is sent the same as any other character. '1B full' conditions 'enter serdes gate' to turn on; 'enter serdes gate' turns on 'enter serdes,' which starts the transferring sequence. 'Enter serdes' turns off the 'EOB' trigger, dropping '1B generate.' 'EOB gate' turns off when the operator releases the EOB key.

While the Ⓑ is in the 1B-register, it is detected and, with 'enter serdes,' turns on the 'end-of-state' latch (IOP 4-B4). The 'end-of-state' latch prevents the reset of the 1B-register. When the operation is completed, the 'operate' trigger turns off.



Note 1: Depending on response, the transmitting terminal may go to either transmit-text/lock or transmit-text mode.

Note 2: From transmit-text/lock mode the transmitting terminal may go to either transmit-text mode (Restart key depressed) or to control-receive mode (EOT key depressed.)

Figure 4-6. Sequence of Mode Operation, Record-Checking

End of state and not operate ('EOS and not O') and 'Ⓑ' turn on the 'D' and 'L' mode triggers (IOP 4-C5). 'A,' 'D,' and 'L' mode triggers put the terminal into transmit-LRC mode. 'Mode change' resets the Ⓑ from the terminal registers.

Transmit LRC-Character

- 'Transmit LRC' brings up the 'transmit answerback' line.
- 'Transmit answerback' and '1B empty' start the control clock.
- '1B set' transfers the LRC-character to the 1B-register.
- '1B full' is forced up by 'parity error or not S8.'
- The LRC-character is placed into the S-register and sent normally.
- Sending the LRC-character changes the mode to receive-check/answerback.

The change to transmit-LRC mode brings the 'transmit LRC' and 'transmit answerback' lines up. 'Transmit answerback' and '1B empty' start the control clock to produce the '1B set' pulse. 'Transmit LRC' and '1B set' transfer the LRC-character from the LRC-register to the 1B-register (IOP 4-D2).

After the LRC-character transfers to the 1B-register, the '1B full' signal must be produced to transfer the character to the S-register. The LRC-character can contain any bit configuration, including the combination in which all 1B-register triggers are off. To ensure that '1B full' is brought up under this condition, the 'parity error or not S8' latch is turned on by the '1B set' pulse (IOP 4-A3), forcing up '1B full.'

Transferring the character to the S-register is done in the normal manner, as is the actual transmission.

The 'end-of-state' latch is turned on by 'transmit answerback' ('transmit LRC'), 'enter serdes,' and 'C1.' When character time is completed, 'EOS and not O' change the mode from transmit-LRC to receive-check/answerback by turning off the 'L' mode trigger (IOP 4-C5). The sending terminal has now sent the EOB- and LRC-characters and is in receive-check/answerback mode, awaiting a Ⓨ or Ⓝ reply from the receiving terminal. The keyboard is locked.

Receive EOB-Character

- The Ⓑ character is received normally and puts the terminal into receive-LRC mode.
- '2B inhibit' prevents the transfer of the Ⓑ to the 2B-register.

The EOB-character is received normally by the receiving terminal and is placed into the 1B-register. While in the 1B-register, the Ⓑ is detected and conditions an AND to turn on the 'L' mode trigger (IOP 5-A5). 'L' on puts the terminal into receive-LRC mode, conditioning the terminal to recognize the next character as the LRC-character. The Ⓑ is added to the LRC-register to complete the receiving-terminal LRC-character. The Ⓑ also brings up '2B inhibit,' which prevents the transfer of the Ⓑ to the 2B-register and the I/O device.

Receive-LRC mode (1) disables the parity-check circuit for the LRC-character, (2) disables the 1B OK circuit so that the LRC-character is not recognized as a control character (the LRC-character can be any bit configuration), and (3) forces up 'invalid character' to prevent a normal '2B set.'

Receive LRC-Character

- The parity circuit is disabled for the LRC-character.
- The LRC-character is added to the LRC-register for comparison.
- Failure to compare turns on the 'error' trigger.
- The 'error' trigger is sampled; if the latch is off, the mode changes directly to transmit-check/answerback; if the latch is on, the hyphen prints and the mode changes to transmit-check/answerback.

The LRC-character is received and loads into the 1B-register. When 'set LRC' comes up, the LRC-character is added to the LRC-register. If the transmit and receive LRC-characters are the same, all LRC-register triggers turn off. This results in dropping the 'LRC error' line (IOP 5-C3). If an LRC-error has occurred, the LRC-characters do not compare, and one or more of the LRC-register triggers remain on. The 'LRC error' line remains up, indicating an LRC-error.

At this point '2B set' is brought up. This is accomplished by forcing the 'parity error or not S8' latch up. 'L,' 'not A,' 'not 2B set,' and 'C1'

turn on the 'parity error or not S8' latch. 'Parity error or not S8' and other conditions shown on (IOP 5-A2) bring up '2B set set gate,' turning on the '2B set' trigger. If the 'LRC error' line is up, '2B set' turns on the 'error' trigger. The 'error' trigger might already be on because of a previous error (parity error, no stop bit, incorrect case, overflow reset). '2B set' also turns the 'end-of-state' latch on.

If the LRC-characters compare, the 'error' trigger does not turn on; the terminal goes into transmit-check/answerback mode. If the 'error' trigger is on, a hyphen is printed, and the terminal goes into transmit-check/answerback mode. The circuit for printing the hyphen is as follows: '2B inhibit' prevents normal entry to all 2B-register triggers, except '2B1.' '2B1' is blocked by 'not L.' Another circuit, however, turns on the '2B1' trigger in the event of an error (IOP 5-B4). This line, '◊ 2B1,' is brought up by '2B set,' the 'L' trigger on,'receive text,' and 'C1.' The B-bit is entered into the 2B-register and a hyphen is printed.

At the end of the printing operation, the 'operate' trigger turns off and 'EOS and not O' comes up. The 'D' mode trigger turns on, the 'L' mode trigger turns off, and the terminal goes into transmit-check/answerback mode. Depending upon the state of the 'error' trigger, the receiving terminal now returns either a Ⓨ or Ⓝ to the sending terminal.

Transmit-Check/Answerback

- Puts receiving terminal into a sending condition.
- Positive response (Ⓨ) sent if 'error' trigger is off.
- Negative response (Ⓝ) sent if 'error' trigger is on.
- After sending either response, the terminal returns to receive-text mode.

Transmit-check/answerback mode places the receiving terminal into a sending condition. Depending upon the condition of the 'error' trigger, a positive or negative response returns to the sending terminal.

The 'send' line is brought up by the 'D' and 'B' mode triggers. The 'send' line starts the serdes clock (IOP 6-C2), allowing the response character to be serialized to the 'serial data out' line. The terminal now enters the correct response character into the 1B-register.

If the 'error' trigger is off, '1B generate' is brought up by 'D,' 'transmit answerback,' 'not L,' and 'not error.' '1B generate' provides gating to the '1B2,' '1B4,' '1B6,' and '1B7' latches and starts the control clock. The control clock pulses bring up '1B set.' The Ⓨ (BA841) is entered into the 1B-register. Note that the '1B4' and '1B7' latches are degated by 'not transmit answerback'; therefore, for a positive response, '1B set' turns on the '1B1,' '1B2,' '1B3,' '1B5,' and '1B6' latches. '1B1' is brought up by '1B set,' 'transmit answerback,' and 'not transmit LRC,' regardless of which response is sent.

If the 'error' trigger is on, '1B generate' does not come up. The control clock is started instead by 'not C2,' 'transmit answerback,' 'D,' and '1B empty,' which condition the '◊C1 gate' line. The control clock pulses again bring up '1B set.' But because '1B generate' is down, only the '1B1' latch turns on, and the Ⓝ negative response is sent.

When either response has been sent, the 'operate' trigger turns off. The 'end-of-state' latch was turned on by 'transmit answerback,' 'C1,' and 'enter serdes.' 'EOS and not O,' along with 'transmit answerback' and 'not transmit LRC,' turn the 'D' mode trigger off (IOP 6-C4). The receiving terminal now returns to receive-text mode, ready to receive data.

Receive-Check/Answerback

- The EOB-check response is received in the normal manner.
- A positive response (Ⓨ) changes the mode to transmit-text.
- A negative response (Ⓝ) prints a hyphen and changes the mode to transmit-text/lock.
- No response causes the terminal to lock in receive-check/answerback mode.

While in receive-check/answerback mode, the sending terminal receives the response to the EOB-check from the receiving terminal. Reception of the response character occurs in the normal manner. When the response character is in the 1B-register, the character is analyzed to determine subsequent action.

The Ⓨ character (BA821) is recognized as a positive response and brings the ' Ⓨ ' line up (IOP 7-A2). A Ⓨ character turns off the 'D' mode trigger, which places the terminal into transmit-text mode. The mode change resets the Ⓨ from the terminal registers. The Ⓨ is not printed because the mode change occurs before the character transfers to the 2B-register.

Any other response character is recognized as a

not Ⓨ , or negative response. This results in the development of a '2B set' pulse. 'Not Ⓨ ' and 'receive answerback' bring up '2B inhibit, 'which blocks all normal inputs to the 2B-register. '2B1,' however, is turned on by '2B set' and 'receive answerback' (IOP 7-B3). A B-bit (hyphen) is entered into the 2B-register and the hyphen is printed. When the operation is complete, the 'operate' trigger turns off. (The 'end-of-state' latch turned on when '2B set' came up.) 'EOS and not O,' 'receive answerback,' and 'D' mode trigger on, turn on the 'F' mode trigger.

The 'A,' 'D,' and 'F' mode triggers (on) develop transmit-text/lock mode. The mode change resets the Ⓝ character from the terminal registers. The terminal keyboard is locked. The operable control keys are the EOT and RST (restart) keys. If the operator presses the EOT key, the terminal goes into control-receive mode. If the operator presses the Restart key, the terminal goes into transmit-text mode, and data transmission can continue.

It is possible that neither a positive nor a negative response is received. This could be the result of the receiving terminal being off at the time the EOB-check is performed. In this case, the terminal remains in receive-check/answerback mode, with the keyboard locked until the Restart key or EOT key is pressed.

Reverse Transmission

Terminals connected to a multiplexer are equipped with reverse transmission. Reverse transmission causes the terminal to go into receive-text mode if a Ⓓ is received in place of the response character. The circuit is shown in the dotted area on IOP 7.

When the terminal is in receive-check/answerback mode and a Ⓓ is received from the multiplexer, the 'B' mode trigger turns on, and the 'A' and 'D' mode triggers turn off.

Restart

- Returns the sending terminal to transmit-text mode following an error response from the receiving terminal.
- Pressing the Restart key turns on the 'restart' trigger.
- The 'restart' trigger gates off the 'D' and 'F' mode triggers.

When an error response is received from the receiving terminal, the sending terminal goes into transmit-text/lock mode. To return the terminal to transmit-text mode, the operator must press the Restart key. When the operator presses the Restart key, the 'restart' trigger turns on. This is accomplished by the conditions shown in Figure 4-7. If the 'D' and 'F' mode triggers are on (transmit-text/lock mode), the 'restart' trigger provides a gate to turn the triggers off. The resulting mode change then turns off the 'restart' trigger.

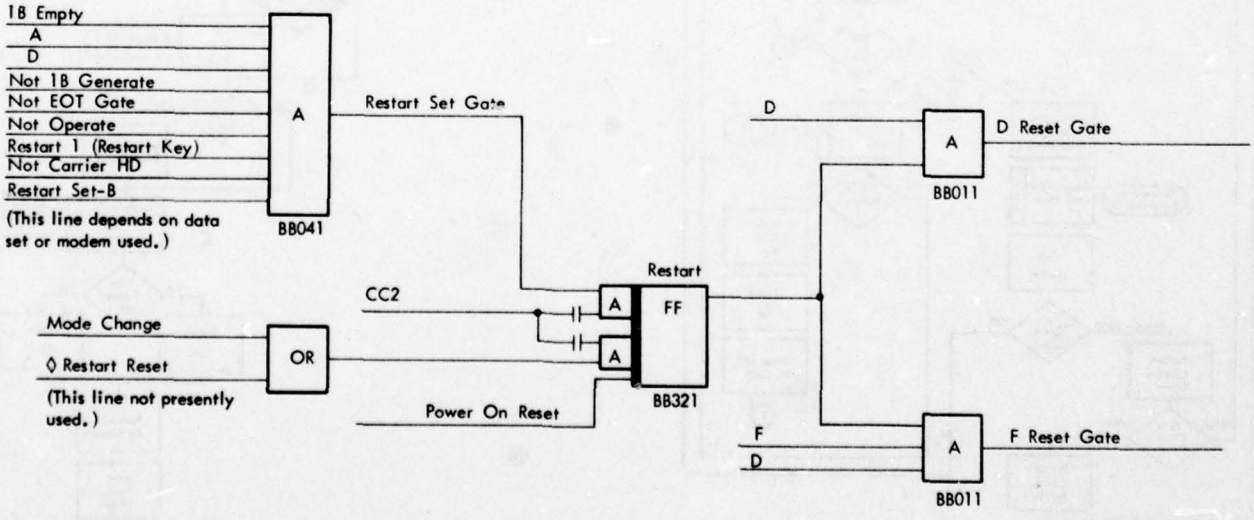


Figure 4-7. Restart Circuit

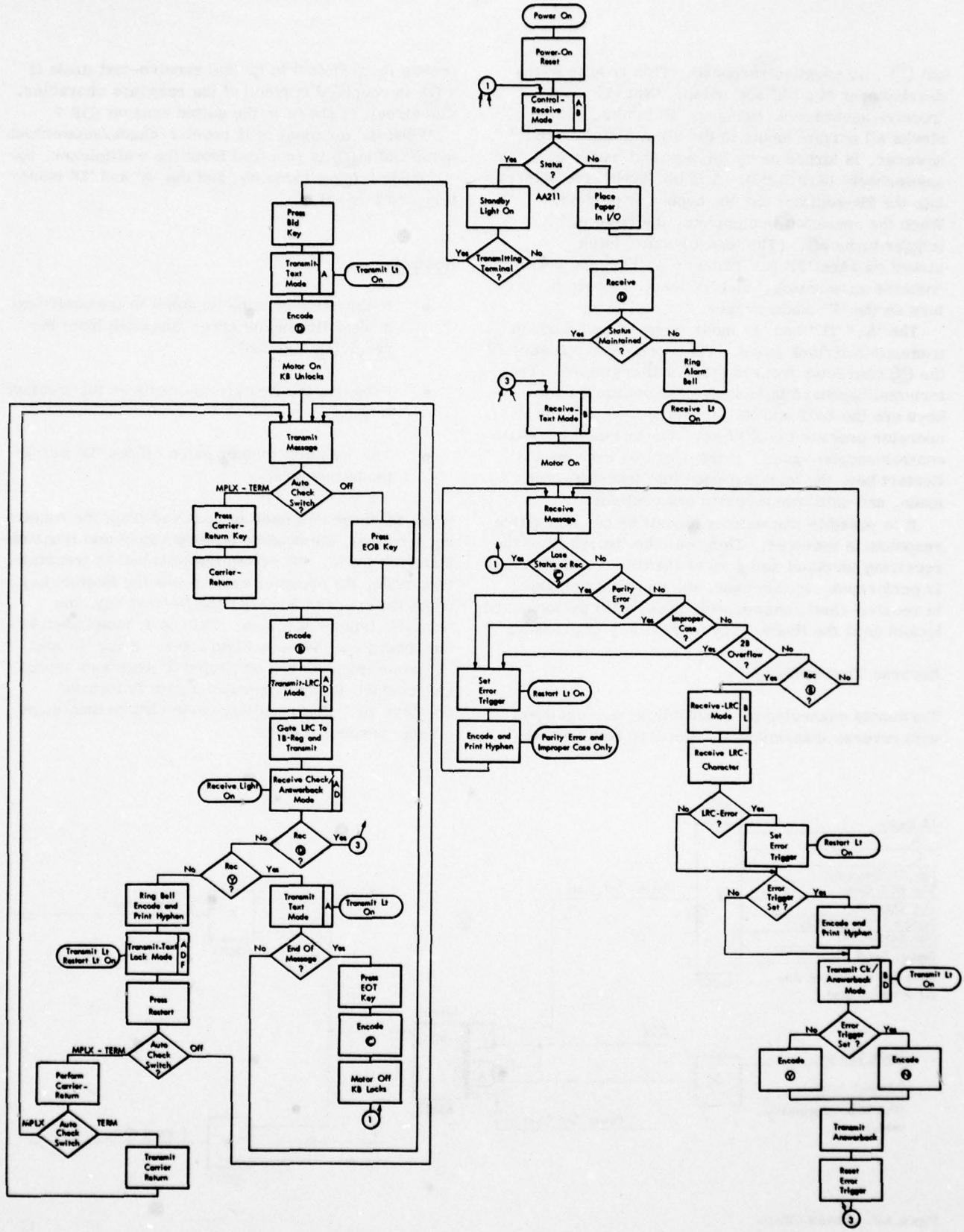


Figure 4-8. Record-Checking and Auto EOB Flowchart

SECTION 2. AUTOMATIC EOB (2740)

- Record-checking feature is a prerequisite.
- Carrier-Return key generates carrier-return and starts EOB-sequence.
- Check switch selects auto-EOB off, terminal-to-terminal, or terminal-to-multiplexer.
- A second carrier-return is forced by a negative response to EOB-check.
- If the Auto-Check switch is at TERM, the second carrier-return character is sent; if the Auto-Check switch is at MPLX, the second carrier-return character is not sent.

The automatic-EOB feature starts the EOB checking sequence whenever the operator presses the Carrier-Return key. A switch permits the terminal operator to select any one of three auto-checking modes: OFF, TERM, or MPLX. The Check switch must be at either TERM or MPLX for the automatic-EOB feature.

Figure 4-8 illustrates the auto-EOB function. When the terminal is in transmit-text mode and the Check switch is at TERM or MPLX, a carrier-return started by the terminal operator causes a carrier-return character and the EOB- and LRC-characters to be sent. The LRC-character is sent in the normal manner, after which the terminal goes into receive-check/answerback mode. If a (Y) answerback is received, the terminal goes into transmit-text mode. If a (N) answerback is received, a hyphen is printed to indicate the error response, and the terminal goes into transmit-text/lock mode.

If a restart is initiated by the operator, the terminal goes into transmit-text mode; and a second carrier-return is performed. The second carrier-return, which occurs only when there is an error response to the EOB-check, synchronizes the communicating terminals to print subsequent data from the left margin. The second carrier-return character is sent if the terminal is connected to another terminal (TERM); the carrier-return is not sent if the terminal is connected to a multiplexer (MPLX).

When the operator presses the Carrier-Return key the I/O-transmit contacts are strobed, transferring the carrier-return character to the 1B-register. The carrier-return code is detected and brings up the 'carrier return code' line (Figure 4-9). The carrier-return character is sent normally as the carrier-return function is performed.

The 'auto EOB' trigger must turn on in order to generate the EOB-character. 'CR code' -- ANDed with 'auto check,' 'TT2,' 'not auto EOB,' 'enter serdes,' and 'C2' -- turns on the 'auto EOB' trigger. 'Auto Check' is active when the check switch is at TERM or MPLX. 'Auto EOB' brings up 'EOB gate,' which turns on the 'EOB' trigger and starts the normal EOB/LRC transmit sequence.

After sending the LRC-character, the terminal goes into receive-check/answerback mode, awaiting a response from the receiving terminal. If a (Y) response is received, the terminal goes into transmit-text mode. The mode change resets the 'auto EOB' trigger.

If the response is not a (Y) , the terminal prints a hyphen and goes into transmit-text/lock mode.

When the operator presses the Restart key, the terminal goes into transmit-text mode; and a second carrier-return is performed. The second carrier-return is caused by the 'force CR' latch. 'Receive answerback' and '2B set,' the same conditions that cause the hyphen to print, turn on the 'force CR' latch. 'Force CR,' ' ANDed with 'TT2' (comes up when the Restart key is pressed) and 'not I/O cycle,' pick the carrier-return magnet, performing the carrier-return.

'Strobe' transfers the carrier-return character to the 1B-register; if the Auto-Check Switch is at TERM, the character is sent. If the Check switch is at MPLX, 'C1 gate' is blocked (see Figure 4-9), preventing the carrier-return character from transferring to the S-register. The 'auto EOB' trigger is reset by 'TT2,' 'auto EOB,' CR code,' and 'C2.' The 'auto EOB' trigger off and the 'CR code' reset the 'force CR' latch.

If the operator presses the EOT key instead of the Restart key, the terminal goes into control-receive mode. The 'auto EOB' trigger is then turned off by 'not B.'

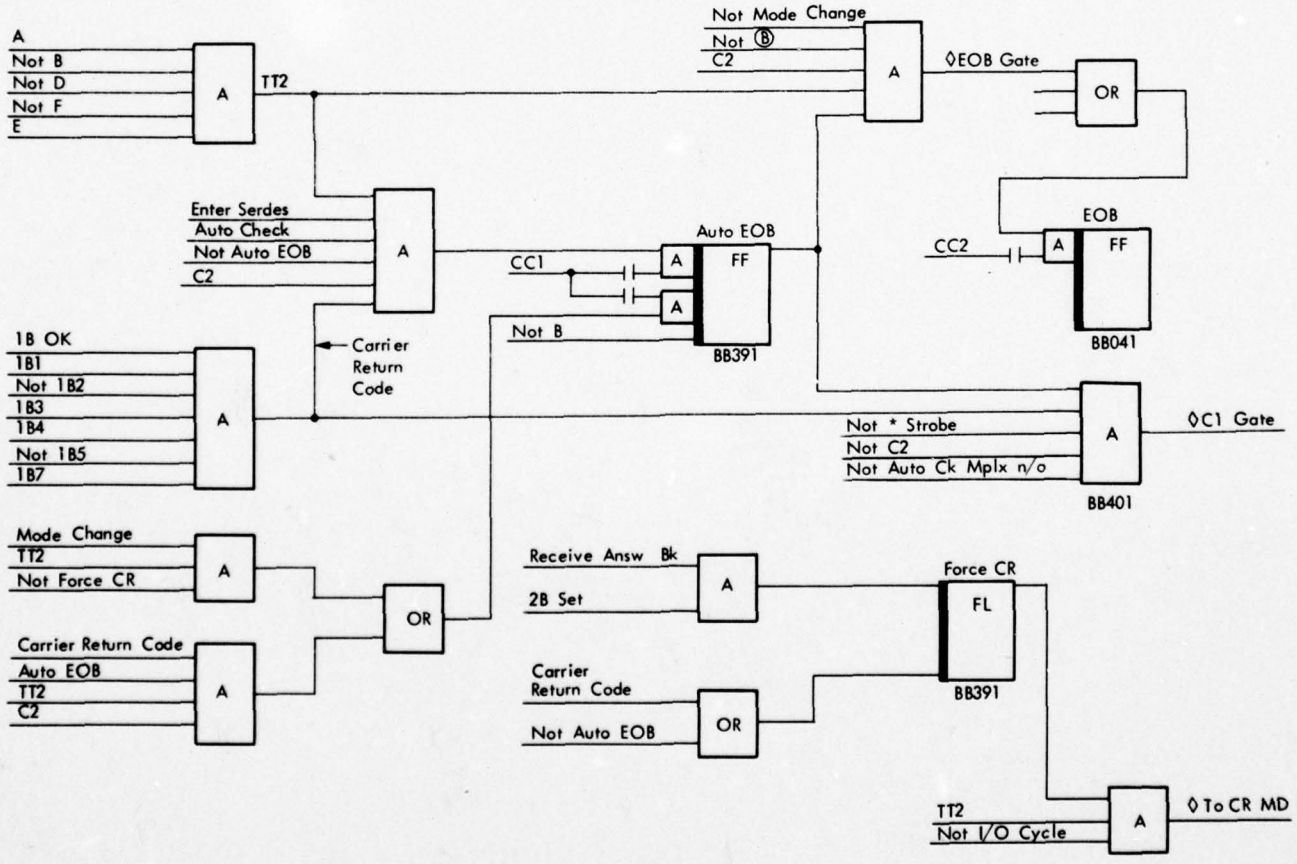


Figure 4-9. Automatic EOB

SECTION 3. DIAL-UP (2740)

- Allows Western Electric 103A (or equivalent) to connect terminal to common-carrier communication system.
- Terminal is disconnected from system when Dial-Disconnect key is pressed.

The dial-up feature permits the 2740 terminal to use the Western Electric 103A data set (or equivalent). This data set allows the terminals to communicate over the common-carrier network (normal dial-telephone service). The terminal operator simply dials the telephone number of the terminal or multiplexer with which communication is desired; once the connection is established, messages can be sent or received. When carrier is received from the data set while the terminal is in control-receive mode, the Dial-Connect light indicates to the operator that a connection has been established.

Figure 4-10 shows the interface from the terminal to the 103A data set. Note that most interface lines are similar to those used by other line adapters. One difference is that the 'clear to send' line is brought up when 'send' ('request to send') comes up. For an explanation of these common lines, see Terminal To Line Adapter Interface.

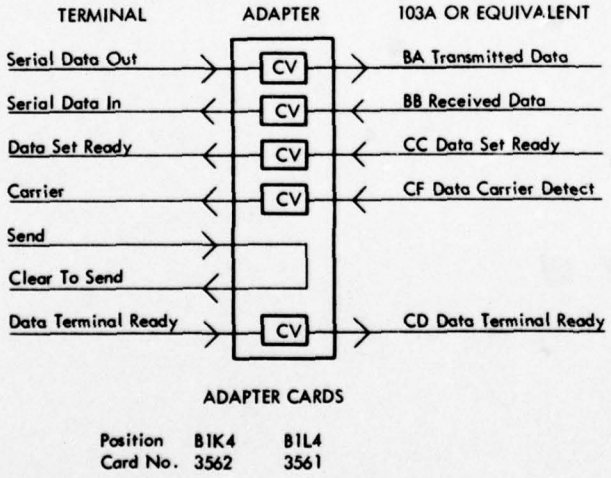


Figure 4-10. Dial-Up Interface (103A)

The following "handshaking" procedure establishes a connection to another terminal or multiplexer data set.

Originating Data Set		Answering Data Set
Lift receiver and dial.*	→	Answer.*
		Auto answer or press data button.* (103A goes into and remains in data mode if 'data terminal ready' is up and remains up.)
		↓
		Wait 1.5 seconds for toll billing.
		↓
Receive F2M.	←	Turn on F2M (answer carrier tone).
↓		
Push data button.*		
↓		
Wait 150 milliseconds; monitor F2M.		
↓		
Unclamp 'receive data' line.		
↓		
Wait 1.5 seconds (remove echo suppressors).		
↓		
Turn on F1M.	→	Receive F1M.
↓		↓
Wait 200 milliseconds (turn-around time).		Wait 150 milliseconds monitor F1M.
↓		↓
Bring up 'data carrier detect' and 'clear to send.'		Unclamp 'receiver data' line.
		↓
		Wait 200 milliseconds (turn-around time).
		↓
		Bring up 'data carrier detect' and 'clear to send.'

Once the connection is established, the terminal operates point-to-point.

*Operator action

Dial-Disconnect

Because a charge is made for the common-carrier line only during the time it is in use, the terminal should be disconnected from the communication line when data cannot be sent or received. Therefore, the status of the terminal controls the data set. A loss of terminal status disconnects the terminal from the communication line. The disconnection is caused by the terminal dropping 'data terminal ready,' which signals the data set to disconnect. The terminal is also disconnected if the operator presses the Dial-Disconnect key on the I/O keyboard.

A special feature is available from the common carrier that permits both ends of the communication line to be disconnected when 'data terminal ready' drops. This feature requires no changes to the terminal.

The condition of 'data terminal ready' is determined by both the condition of the 'status' trigger and the 'dial disconnect' latch (see Figure 3-17). If the 'status' trigger is off (lack of paper, local mode, or loss of data-set status) 'data terminal ready' drops. Turning on the 'dial disconnect' latch (operator pressing the Dial-Disconnect key) also drops 'data terminal ready.'

SECTION 4. TRANSMIT CONTROL (2740)

- Allows a computer to control the sending or receiving status of the terminal.
- The terminal goes into receive mode when a Ⓓ is received.
- The terminal goes into transmit mode when a 2-character sequence (slash-space) is received.
- If, during a period of 15 seconds, no key is pressed, the 'time-out 15' latch turns on, causing the terminal to go into control-receive mode.

The transmit-control feature allows a computer to control the sending or receiving status of a terminal. The dial-up feature is a prerequisite for this feature. The terminal goes into receive mode when the multiplexer sends a Ⓓ character. This operation is identical to basic terminal operation and is accomplished in the same manner.

The terminal goes into transmit mode when the multiplexer sends a special 2-character sequence (Figure 4-11). This sequence consists of a slash (/) followed by a space. Receipt of this 2-character sequence places the terminal into transmit mode and automatically causes a Ⓓ character to be returned to the multiplexer. Once the terminal is in either transmit or receive mode, it operates the same as a basic terminal.

The following explains how the terminal goes into transmit text mode (IOP 8). The operation begins when the slash is received by the terminal. The slash is received in the normal manner, is detected, and turns on the 'F' mode trigger. Turning the 'F' mode trigger on (with the 'A' and 'B' mode triggers already on) puts the terminal into intermediate control-receive mode, which conditions the terminal to receive the space character. The space character is also received normally and is detected by an AND. The output of the AND, 'space,' goes to several AND's shown on IOP 8-C3. 'Space' and 'intermediate control receive' turn off the 'F' and 'B' mode triggers and turn on the 'bid' trigger. This places the terminal into transmit mode and causes a Ⓓ character to be sent. When the Ⓓ is sent, (1) the alarm bell rings, (2) the motor turns on, and (3) the keyboard unlocks. If the second character is not a space, the 'F' trigger turns off and the terminal returns to control-receive mode.

When the terminal is in transmit mode and the operator does not press any key for 15 seconds, the terminal returns to control-receive mode. IOP 8-D3 shows the circuit. 'Not 1B generate,' 'send,' 'not strobe O,' 'not operate,' and '1B empty' condition an AND. This AND indicates that no operation is taking place. The output of the AND enters a 15-second time delay. If no operation occurs for 15 seconds, the time delay times out, and its output turns on the 'time-out 15' latch. The output of the latch turns on the 'B' mode trigger and blocks an AND to the input of the 'strobe O' trigger (to prevent further operations). The control clock must run in order to generate pulses to change the mode. The control clock is gated on by the 'C1 gate.' The conditions to bring up this line are 'multiplexer transmit control,' 'not garble,' 'not C1,' and time-out 15' latch on. Transmission with the transmit-control feature is ended normally by sending a Ⓒ character.

A 2-position switch is mounted on the side of the terminal. This switch can be in either the MTC (multiplexer transmit control) or the OFF position. While at OFF, the terminal operates normally, except that the time-out 15 feature is retained.

Any telephone in the country can call a terminal and be connected. Therefore, the terminal must not become tied up if a non data-type telephone makes a connection. Only a data set or modem is capable of generating carrier; a standard telephone is not. Note on IOP 8-E1 that an AND inputs to the 'time-out 15' latch, the conditions of which are 'data set ready' and 'not carrier.' If 'data set ready' is up and no carrier is received for 15 seconds, the 'time-out 15' latch turns on. 'Time-out 15' and 'not carrier' cause a dial-disconnect to disconnect the data set from the common-carrier lines.

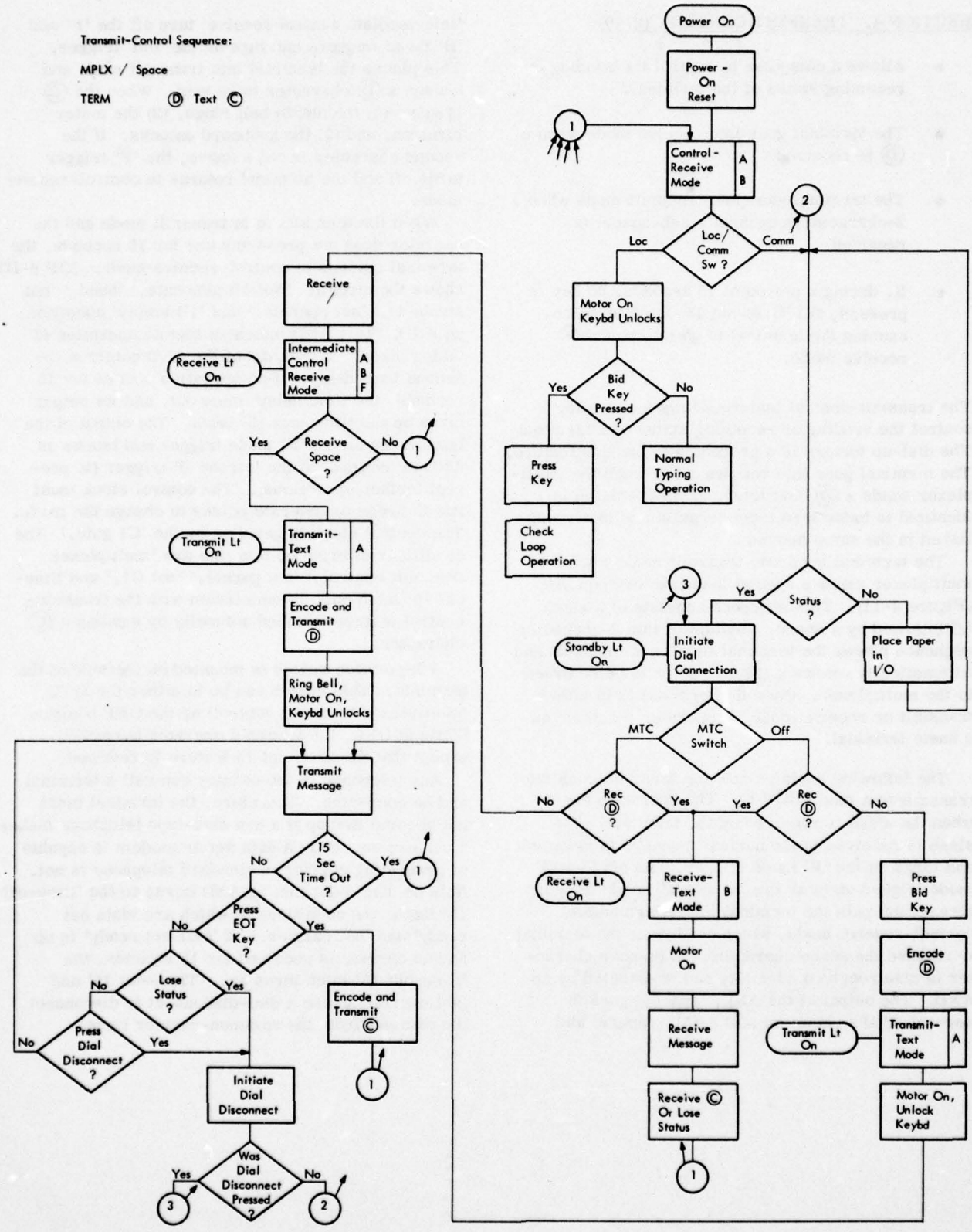


Figure 4-11. Transmit Control Flowchart

SECTION 5. STATION CONTROL (2740)

INTRODUCTION

- Allows more than one terminal to be connected to a computer by a single communication line.
- A terminal is addressed to receive data.
- A single terminal, a group of terminals, or all terminals on the communication line can be addressed.
- A terminal is polled to send data.
- Only one terminal is polled at a time.

The station-control feature permits more than one terminal to be connected to a computer (via a multiplexer) by means of a single communication line (Figure 4-12). A single communication line greatly reduces the cost of communication facilities to the customer. In order for terminals to communicate with the computer without contention (more than one terminal attempting to use the communication line at the same time), a special addressing and polling scheme is used.

Addressing is preparing a terminal or group of terminals to receive data.

Polling is informing an individual terminal that it alone can send data. Each terminal is polled in a predetermined order that is controlled by computer programming. To send data, the operator presses the Bid key before the next poll. When polled, the terminal goes into transmit-text mode; the operator can then send a message.

Addressing and polling are accomplished by sending a special sequence of characters to the terminal (Figure 4-13). Note that the Ⓓ, Ⓒ, Ⓝ, and Ⓨ characters are the same as used in other terminal operations. The Ⓢ (comma, A821C) identifies the addressing operation.

Each terminal is assigned three addresses: an individual terminal address, a group address, and an all-call address (Figure 4-12). The terminal address consists of an alphabetic character and a space. The terminal address is used for both polling and addressing, and identifies each terminal. A group address, which also consists of an alphabetic character and a space, is assigned to two or more terminals. Both terminal and group addresses are wired into the terminal (using jumpers) by the Customer Engineer. The group address, used only for addressing, allows all terminals in the addressed group to receive the computer message. The all-call address (not wired) is a slash (/)-space, and enables all terminals on the communication line to receive the computer message.

When either a group or all-call address is used, one terminal in the group is assigned the role of master (all others being slaves). For the all-call address, only one terminal on the communication line is designated master. For the group address, one terminal in each group is designated master. A master is designated by Customer-Engineer wiring (using jumpers). The all-call or group master responds to the addressing sequence by informing the multiplexer of the status of the terminal. Only the status of the master terminal is sent to the multiplexer; if a slave terminal does not have status, the terminal does not receive the message.

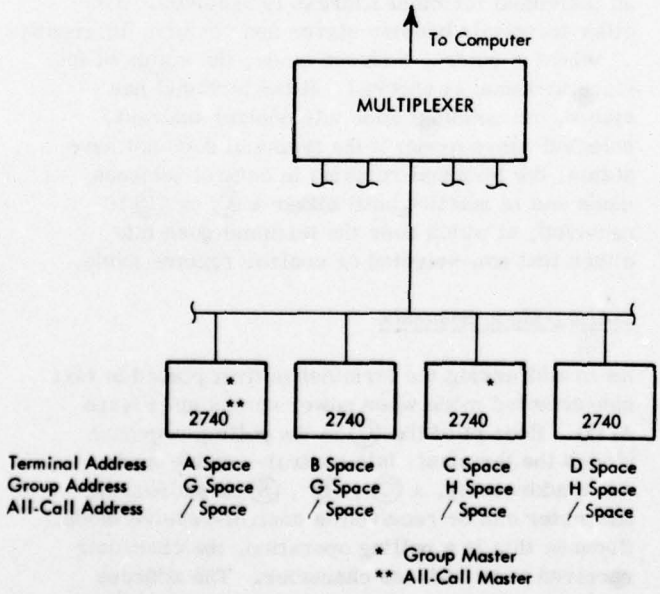


Figure 4-12. Station Control, Terminal Configuration

ADDRESSING	
MPLX To TERM	Ⓒ Ⓢ Add Char Space Ⓓ Receive Text Ⓒ
TERM To MPLX	Ⓝ or Ⓨ

POLLING	
MPLX To TERM	Ⓒ Add Char Space
TERM To MPLX	Ⓝ or Ⓓ Transmit Text Ⓒ

Figure 4-13. Addressing and Polling Character Sequence

Addressing Mode Sequence

Terminal operation with station control is dependent upon the terminal mode (Figure 4-14). The terminal is first placed in text non-selected mode when power comes up. In text non-selected mode, only receipt of a Ⓒ can cause a mode change. The Ⓒ places the terminal in control-receive mode. In control-receive mode, the terminal can recognize a Ⓓ, Ⓢ, or any alphabetic address-character. Because an addressing sequence is being received, the next character received is the Ⓢ. The Ⓢ indicates that the terminal is being addressed (not polled) and places the terminal in control-address mode. In control-address mode, the terminal can recognize a Ⓒ, Ⓓ, terminal address, group address, or an all-call address. This explanation assumes that a terminal address is being received.

Terminal Address

The terminal address is recognized and places the terminal in control-address/selected mode. Only the terminal that is wired for the received address-character changes mode; unselected terminals remain in control-address mode until either a Ⓒ or Ⓓ is received.

The next character in the addressing sequence is the space. The space character causes the terminal to go into transmit-status/answerback mode. In this mode, the status of the terminal is checked and a response returns to the multiplexer in the form of a Ⓝ or Ⓨ character. The Ⓝ indicates to the multiplexer that the terminal does not have status and that the computer message should not be sent. The alarm bell rings to notify the operator that the terminal was addressed.

If a Ⓨ is sent by the terminal, status is indicated, and the multiplexer can send its message. Sending the Ⓨ places the terminal into control-selected mode. In this mode, the terminal waits for the first character (Ⓓ) of the message. (The multiplexer can send a Ⓒ, in which case the terminal goes into control-receive mode.) Receipt of the Ⓓ places the selected terminal into receive-text mode and the unselected terminals into text non-selected mode. Should the terminal lose status during the message, the terminal is returned to text non-selected mode.

When the message is completed, the multiplexer sends a Ⓒ, which informs the terminal that the message is completed and causes the terminal to go into control-receive mode.

MODES	A	B	E	F
Text Non-selected	1	1	1	0
			↓	
Control-Receive	1	1	0	0
	↓			
Control-Address	0	1	0	0
				↓
Control-Address/Selected	0	1	0	1
	↓			
Transmit-Status/Answerback	1	1	0	1
	↓		↓	
Control-Selected	0	1	1	1
				↓
Receive-Text	0	1	1	0
	↓		↓	
Control-Receive	1	1	0	0

Figure 4-14. Addressing, Mode Sequence

Group or All-Call Address

When a group or all-call address is received, the sequence up to control-address mode is the same as for the terminal address. In control-address mode, however, the group or all-call address is recognized by more than one terminal. Only the master terminal can send an answerback; all other terminals (slaves) must not send an answerback. The master of the group performs exactly as when an individual terminal address is received. All other terminals become slaves and perform differently.

While in control-address mode, the status of the slave terminal is checked. If the terminal has status, the terminal goes into control-address/selected-slave mode; if the terminal does not have status, the terminal remains in control-address mode and is inactive until either a Ⓒ or Ⓓ is received, at which time the terminal goes into either text non-selected or control-receive mode.

Polling-Mode Sequence

As in addressing, the terminal is first placed in text non-selected mode when power comes up (Figure 4-15). Receipt of the Ⓒ in the polling sequence places the terminal into control-receive mode. As in addressing, a Ⓒ, Ⓓ, Ⓢ or addressing character can be received in control-receive mode. Because this is a polling operation, the character received is an address character. The address character places the terminal into intermediate-polling mode.

In intermediate-polling mode, the bid circuit is checked to see whether the Bid key has been pressed.

MODES	A	B	E	F
Text Non-selected	1	1	1	0
			↓	
Control-Receive	1	1	0	0
			↓	↓
Intermediate Polling	1	1	1	1
See note.		↓		
Transmit-Poll/Answerback	1	0	1	1
		↓		↓
Transmit-Text	1	0	1	0
		↓	↓	
Control-Receive	1	1	0	0

Note:
At this point the terminal can go to either transmit-poll/answerback (Bid key not pressed) or to transmit-text (Bid key pressed).

Figure 4-15. Polling, Mode Sequence

When the space is received and the Bid key has been pressed, the terminal goes into transmit-text mode. A (D) is returned to the multiplexer. The operator can then send the message. If the Bid key has not been pressed, the terminal goes into transmit-poll/answerback mode. A (N) is sent to notify the multiplexer that the terminal has no message. The terminal then returns to control-receive mode.

When the operator finishes the message, he presses the EOT key to send a (C) and return the terminal to control-receive mode. The terminal is now available to be polled or addressed.

FUNCTIONAL UNITS

Garble

When the terminal is first turned on, it can receive data in mid-character (garble). If this occurs, the terminal might interpret the incomplete character(s) as a valid control character. Furthermore, the terminal might achieve a status that would interfere with proper operation of the line. In order to prevent the unpredictable effects of garble, the terminal is prevented from responding to line data for 15 seconds after power is turned on. Within 15 seconds, the 'S0' and 'S8' relationship to the start and stop bits of the received character is correct.

When power first comes up, the 'power on reset' line turns on the two garble triggers (Figure 4-16). The garble circuit (1) blocks the '1B set' line, (2) prevents recognition of a character as a parity error

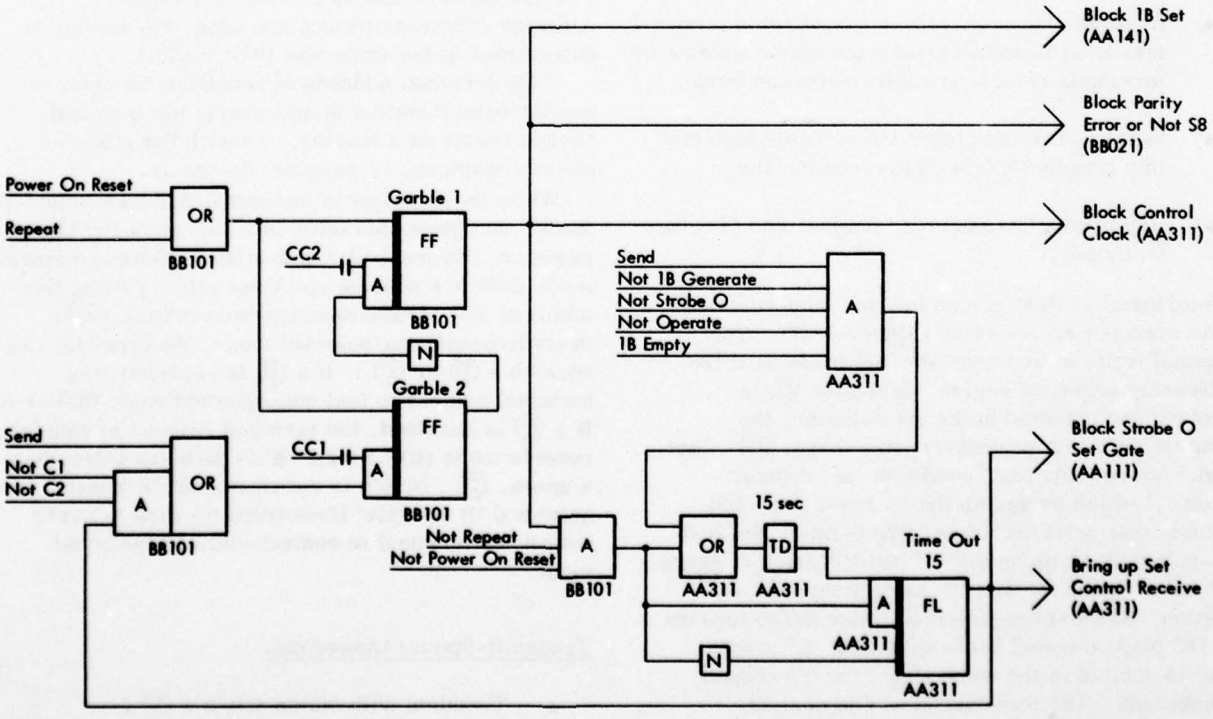


Figure 4-16. Garble and Time-Out 15

or not S8 error (no stop bit), and (3) prevents operation of the control clock. The output of the garble circuit, ANDed with 'not repeat' and 'not power on reset,' starts a 15-second time delay. Fifteen seconds after the time delay is conditioned, the 'time-out 15' latch turns on. The output of the 'time-out 15' latch, ANDed with 'not C1' and 'not C2,' turns off the 'garble 2' trigger (see Figure 4-16). The 'garble 2' trigger turns off the 'garble 1' trigger and the 'time-out 15' latch, allowing the terminal to receive data.

Time-Out 15

The time-out 15 circuit (see Figure 4-16) operates the same as in transmit control. Its purpose is to return the terminal to control-receive mode if more than 15 seconds elapse between depressions of the I/O-device keys.

PRINCIPLES OF OPERATION

Addressing

- Ⓒ places the terminal into control-receive mode.
- Ⓢ places the terminal into control-address mode.
- Address character places the selected terminal into control-address/selected mode; unselected terminals remain in control-address mode.
- Space character places the selected terminal into transmit-status/answerback mode.
- Ⓓ places the selected terminal into receive-text mode.

The terminal is first placed into text non-selected mode when power comes up (Figure 4-17). The terminal waits in text non-selected mode until the addressing sequence begins. When the Ⓒ is received and detected in the 1B-register, the terminal goes into control-receive mode. 'Ⓒ', 'not send,' and 'not operate' condition 'set control receive,' which brings up the 'E reset gate' and 'set text non-selected' lines (IOP 9-A3). 'Set text non-selected' turns on the 'A' and 'B' mode triggers and turns off the 'D' and 'F' mode triggers. In addition, 'set text non-selected' attempts to turn on the 'E' mode trigger; but because the 'E' reset gate' is applied at the same time, the 'E' trigger remains off. The terminal is now in control-receive mode, awaiting reception of the Ⓢ character.

The Ⓢ is received and detected in the 1B-register, bringing up 'A reset gate' (IOP 9-B4), which places the terminal into control-address mode. The reception of the Ⓢ character determines whether the operation is to be addressing or polling. While the terminal is in control-address mode, a Ⓓ, Ⓒ, terminal address, group address, or all-call address can be received.

If the all-call address (/) is received, the operation is as follows: The 'F set gate' line comes up, and the terminal goes into control-address/selected mode (IOP 9-B4). The conditions that bring up 'F set gate' are detection of the slash character, 1B OK, and control-address mode. While the terminal is in control-address mode, it is necessary to determine whether the terminal is a master or a slave. If the terminal is a master, only 'F set gate' comes up. If the terminal is a slave. 'B reset gate' and 'F reset gate' come up. Whether the terminal is a master or a slave depends upon whether the all-call jumper (IOP 9-C2) is wired.

If the jumper is wired, the terminal goes into control-address/selected mode. If the jumper is not wired, the terminal goes into control-address/selected-slave mode. (The difference between the master and slave modes is that for the master, the 'B' mode trigger is on; for the slave, it is off.)

If the group address is received, the preceeding operation repeats. Again, it must be determined whether the terminal is a slave or a master. Although different circuits are used, the master is determined in the same way (IOP 9-C2).

If the terminal address is received, no slave or master determination is necessary; the terminal always reacts as a master. As with the group or all-call masters, 'F set gate' comes up.

While the terminal is in control-address/selected mode, the space character is received in the 1B-register. 'Space,' 'B,' and control-address/selected mode (IOP 9-E3) bring up 'A set gate,' putting the terminal into transmit-status/answerback mode. In control-address/selected mode, the terminal can receive a Ⓓ or Ⓒ. If a Ⓓ is received, the terminal returns to text non-selected mode (IOP 9-A2). If a Ⓒ is received, the terminal returns to control-receive mode (IOP 9 A2). If a character other than a space, Ⓓ, or Ⓒ is received, the 'F reset gate' and 'B set gate' lines come up (IOP 9-E4) to return the terminal to control-address/selected mode.

Transmit-Status/Answerback

- Terminal with status sends a Ⓨ.
- Terminal without status sends a Ⓝ.

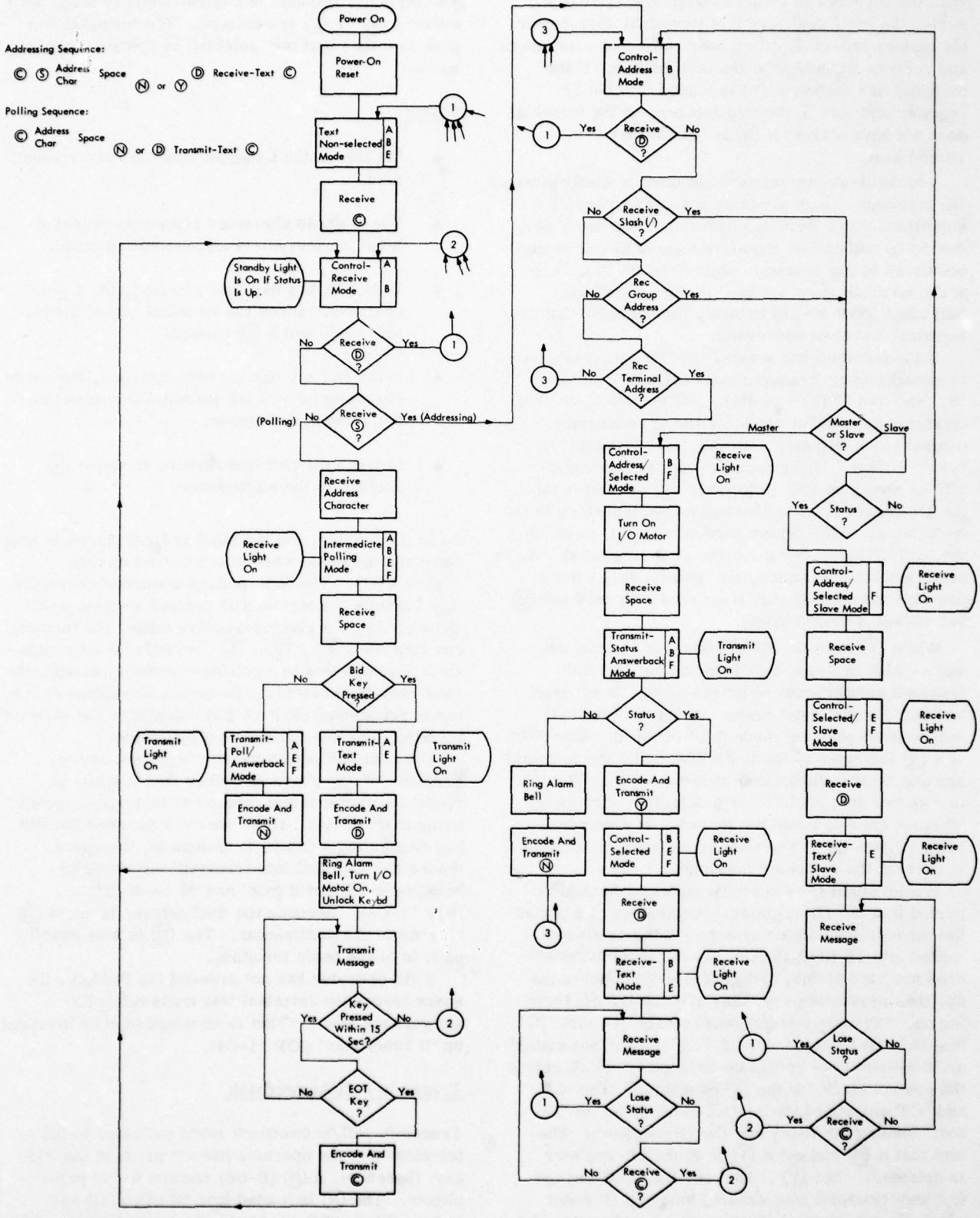


Figure 4-17. Station Control Flowchart

With the terminal in transmit-status/answerback mode, the individual terminal (terminal address) or the master (all-call, group address) checks its status and returns an answer to the multiplexer. If the terminal has status, a Ⓨ is loaded into the 1B-register and sent to the multiplexer. If the terminal does not have status, a Ⓝ is loaded into 1B and sent.

Transmit-status/answerback mode actually places the terminal, which previously was in a receiving condition, into a sending condition. The 'send' line comes up and causes the serdes clock to run continuously as in any transmit mode (IOP 10-C3). Also, if the terminal does not have status, the alarm bell rings (IOP 10-C3) to notify the operator that the terminal has been addressed.

If the terminal has status, the '1B generate' line is brought up by 'transmit-answerback,' 'status,' 'B,' and 'not D' (IOP 10-B1). '1B generate' coming up starts the control clock for the Ⓨ character. The control clock outputs, 'C1' and 'C2,' bring up '1B set.' '1B set,' '1B generate,' and the other conditions shown on IOP 10 load the Ⓨ character into the 1B-register. The character then transfers to the S-register. When 'enter serdes' and 'C1' come up, the 'end-of-state' trigger turns on (IOP 10-C1). As in basic machine operation, the 'end-of-state' latch prevents the 1B-register from resetting until the Ⓨ has caused a mode change.

While Ⓨ is in the 1B-register, it is detected and -- with 'B,' 'not D,' 'EOS and not O,' and 'transmit answerback' -- brings up the 'E set gate' and the 'A reset gate' lines, putting the terminal into control-selected mode (IOP 10-BC5). Reception of a Ⓨ indicates to the multiplexer that the terminal has status; the multiplexer returns a Ⓓ . The Ⓓ is detected and, with 'control selected,' brings up 'F reset gate' to place the terminal in receive-text mode (IOP 9-F3). The terminal is now conditioned to receive the computer message.

If a terminal does not have status, a hyphen is loaded into the 1B-register. Regardless of whether the terminal has status or not, a B-bit is always loaded into 1B (IOP 10-A3). Because the terminal does not have status, '1B generate' does not come up, thus preventing any other 1B- latch from turning on. 'Transmit-status/answerback' -- with 'B,' 'not D,' '1B empty,' 'not C2,' and either 'not status' or 'time-out 1' -- brings up '◊C1 gate,' which starts the control clock for the Ⓝ character. The 'C1' and 'C2' outputs of the control clock bring up '1B set,' loading the B-bit into the 1B-register. The fact that a Ⓝ and not a Ⓨ is in the 1B-register is detected. 'Not Ⓨ ,' 'B,' not D,' 'EOS and not O,' and 'transmit answerback' bring up 'F reset gate'; the terminal goes into control-address mode.

The terminal remains in control-address mode until either a Ⓓ or Ⓒ is received. The terminal then goes to either text non-selected or control-receive mode.

Polling

- Ⓒ places the terminal into control-receive mode.
- The address character places the selected terminal into intermediate-polling mode.
- If the Bid key has been pressed, the space character places the terminal into transmit-text mode and a Ⓓ is sent.
- If the Bid key has not been pressed, the space character places the terminal into transmit-poll/answerback mode.
- In transmit-poll/answerback mode, a Ⓝ returns to the multiplexer.

As in addressing, the terminal is first placed in text non-selected mode when power comes up (see Figure 4-17). The first polling-sequence character, Ⓒ , places the terminal in control-receive mode (IOP 11-A3). In control-receive mode, the terminal can receive a Ⓒ , Ⓓ , Ⓢ , or addressing character. Because this is a polling operation, an address character is received. The terminal address character is recognized (IOP 11-B2) and places the selected terminal into intermediate-polling mode.

The next polling-sequence character, space, arrives. If any character other than a space is received, the terminal returns to text non-selected mode (IOP 11-A4). If the operator presses the Bid key (indicating a desire to transmit), the space places the terminal into transmit-text mode by bringing up 'F reset gate' and 'B reset gate' (IOP 11-C4). Because the 'bid' trigger is on, a Ⓓ returns to the multiplexer. The Ⓓ is sent exactly as it is in the basic terminal.

If the operator has not pressed the Bid key, the space places the terminal into transmit-poll/answerback mode. This is accomplished by bringing up 'B reset gate' (IOP 11-C4).

Transmit-Poll/Answerback

Transmit-poll/answerback mode indicates to the terminal that the operator has not pressed the Bid key; therefore, a Ⓝ (B-bit) returns to the multiplexer. The Ⓝ is loaded into 1B when '1B set' is brought up (IOP 12-A2) by the control clock. The

control clock is started by 'transmit answerback,' 'not B,' '1B empty,' and not C2' (IOP 12-B2). When 'enter serdes' comes up, the 'end-of-state' latch turns on to prevent the reset of 1B until the character has been sent. When the (N) has been sent, 'EOS and not O' causes the terminal to return to control-receive mode (IOP 12-C2).

SECTION 6. DIAL-UP (2741)

The dial-up feature for the 2741 operates the same as for the 2740, except for one difference. When 'send' ('request to send') comes up, 'clear to send' delays 330 ms. The delay is needed to allow for turn-around time. In the 2740, turn-around (from receive to transmit) is accomplished when the operator presses the Bid key. Operator action takes enough time to allow for the turn-around. In the 2741, the computer causes turn-around; additional time must be allowed before data can be sent.

SECTION 7. INTERRUPT (2741)

- While in receive mode, the terminal sends a 200 ms "space" to the multiplexer to allow the terminal to go into transmit mode before completion of the multiplexer message.

- The terminal must be connected to the multiplexer on full-duplex lines.

This feature is used only when the terminal is in the receive-text mode. If the operator wishes to stop the multiplexer from sending, he presses the Attention key to place a 200 ms "space" on the 'serial data out' line. The multiplexer senses the long space and sends a Ⓒ character back to the terminal. This places the terminal into transmit-text mode and the terminal sends a Ⓓ . The operator can now send new instructions to the multiplexer.

Figure 4-18 shows the interrupt logic. If the operator presses the Attention key while the terminal is in receive-text mode, the 'interrupt' trigger turns on. 'Interrupt' and 'not power on reset' start a 200 ms single shot. The output of the single shot, ANDed with 'not A' and 'B,' transmits the 200 ms "space" to the multiplexer. When the Attention key is released, the N/C contact makes, turning off the 'interrupt' trigger and the 'IB' latch. The 'IB' (inhibit interrupt) latch acts as an interlock to prevent the terminal from sending a "space" if the Attention key is held while the terminal is in transmit-text mode. If the 'IB' latch were not in the circuit and the operator held the Attention key depressed to transmit a Ⓒ , the terminal would go into receive-text mode and then return to transmit-text mode.

The 'halt 1' line is also an interlock. In this case, however, 'halt 1' prevents the terminal from going from transmit-text mode to receive-text mode and then back to transmit-text mode. If the Attention key is held depressed while the operator is attempting an interrupt, the 'halt 1' line (held up by the 'interrupt' trigger) prevents turning on the 'EOT' trigger.

In order to use this feature, the terminal must be connected to the multiplexer on full-duplex lines. This is necessary so that the terminal can send the "space" at the same time that it is receiving data.

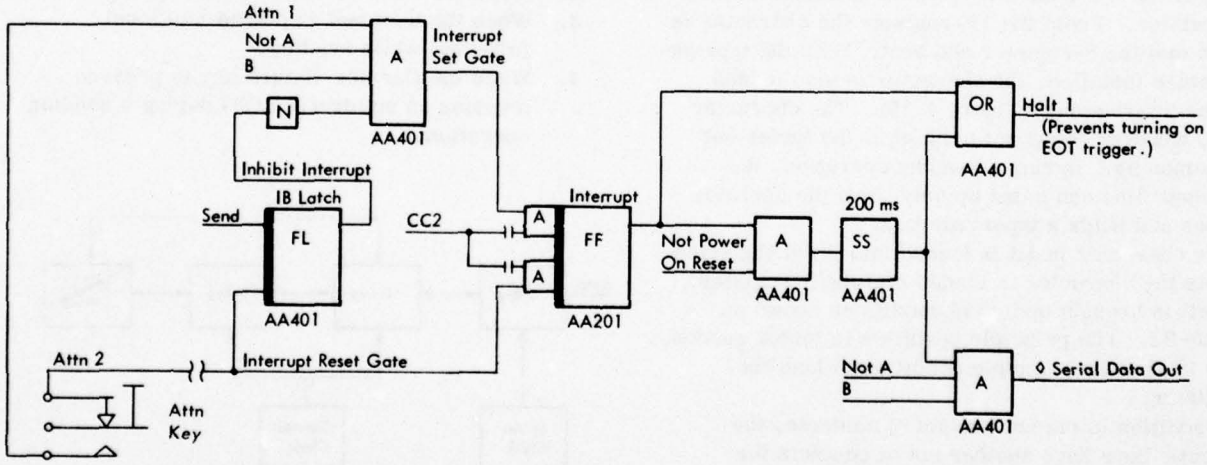


Figure 4-18. Interrupt

SECTION 8. TYPAMATIC (2741)

- Permits automatic repeating of space, underscore/dash, or backspace.
- Repeating is accomplished by circuitry.
- The transmission character is loaded into 2B.
- I/O device is synchronized with the S-register.

The typamatic feature causes the 2741 to automatically repeat I/O cycles if any of the typamatic keys are held depressed. For example, if the operator presses and holds the Space key, the I/O device continues to space until the Space key is released. If any typamatic key is pressed, but not held, a single I/O cycle occurs. In the standard SELECTRIC, repeating is made possible by mechanical changes to the SELECTRIC. For the I/O SELECTRIC, however, repeating is accomplished by circuitry (no mechanical changes to the I/O device are made). Circuits must be used because the unrestricted speed of the I/O device can overrun the terminal logic. Therefore, the I/O device must be synchronized with the operation of the S-register.

During a sending operation, the character that is set up in the I/O transmit contacts is loaded into the 1B-register. From the 1B-register the character is loaded into the S-register and sent. With the typamatic feature installed, the character is also loaded into the 2B-register (Figure 4-19). The character in 2B, however, does not print until the 'print-out' line comes up. During a sending operation, the 'print-out' line can come up only when the operator presses and holds a typamatic key.

The character in 1B is loaded into 2B at the same time as the character is loaded into the S-register. '2B set' is brought up by the conditions shown on IOP 13-B1. The principle condition is 'enter serdes,' which is also the principle condition to load the S-register.

In addition to the normal set of contacts, the typamatic keys have another set of contacts for typamatic operation (the Underscore/Dash and Backspace keys share the same set of typamatic contacts). For the typamatic operation to begin, the key must be held at least 100 ms. The 100 ms delay, in addition to ensuring that the key has been held and not just pressed, ensures that any character in 2B has had time to reset.

When a typamatic key is pressed and held, the 100 ms delay times out and, with 'not I/O cycle' and '2B full,' turns on the 'type' trigger (IOP 13-C2). The 'type' trigger does three things: (1) frees the printout circuit, (2) disables the 2B-overflow reset circuit, and (3) brings up 'incorrect case' to prevent any shift during the typamatic operation.

The character is printed normally the first time. As soon as the operation is completed (indicated by 'not I/O cycle'), the 'print-out' line comes up, transferring the character in 2B to the I/O magnets, just as in a receiving operation. The cycle repeats as long as the 'type' trigger is on. When the typamatic key is released and the last character is transferred out of 2B, the 'type' trigger turns off.

The typamatic feature also causes one other change in basic-2741 logic. In addition to the normal 2B-reset conditions, the 'TOM (typamatic) 2B reset' trigger is added (IOP 13-B2). The 'TOM 2B reset' trigger causes the 2B-register to reset during the following times:

1. When the Attention key is pressed during a sending operation (transmit EOT).
2. When the terminal is in control-receive mode.
3. When the terminal is placed into local (off-line) while sending.
4. When the Carrier-Return key is pressed (causing an automatic EOT) during a sending operation.

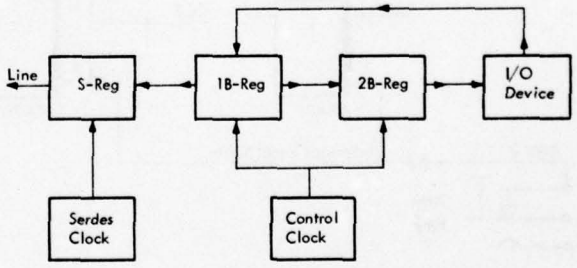


Figure 4-19. Typamatic Data Flow

Figure 5-1 is a block diagram of the 2740/2741 power supply and input voltages for domestic and World Trade use. The different voltages and cycles are accomodated by using a different transformer, different taps on the transformer, or both. Internally, the power supply functions the same for all inputs. The outputs of the power supply are: +48 volts dc, +12 volts dc, and -12 volts dc. The +48 volts is used in the I/O device. The +12 and -12 volts are used by the SLT logic. The power supply also supplies the power-on reset, described in Chapter 3.

Although similar to the 2740 power supply in every other respect, the 2741 power supply does not contain an alarm bell.

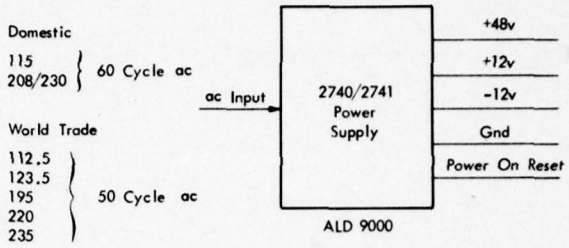


Figure 5-1. Power Supply

CE AID BOX

- Used for dynamic troubleshooting.
- Shows condition of 1B-register, mode triggers, and 'parity error or not S8' trigger.
- Allows terminal to be single-cycled.
- Contains a space-character generator.

The 2740/2741 CE Aid Box helps the Customer Engineer diagnose terminal failures under dynamic conditions. The CE aid box allows the CE to observe the contents of the 1B-register, the condition of the mode triggers, and the condition of the 'parity error or not S8' (P) latch. A single-cycle circuit that allows the terminal to be cycled through its operations is incorporated into the CE aid box. In addition, the reception of a space character can be simulated using the space-generator circuit. The space generator causes the terminal to receive spaces continuously so that the CE can check the terminal and the I/O device.

The CE aid box is an external device that is plugged into a receptacle on the terminal gate. All power for the CE aid box is provided by the terminal power supply. Figure 6-1 shows the location of the CE aid box lights and switches.

Single Cycle

- Character is held in 1B until CE presses Cycle pushbutton.

By setting the 1CH (1 cycle halt) switch at ON, the CE can single cycle the terminal. If the switch is at OFF, the terminal operates normally. For a sending operation, a character is loaded into the 1B-register. If the 1CH switch is on, however, the control clock is not allowed to run, thus preventing the character from transferring to the S-register. When the CE presses the Cycle pushbutton, the control clock starts; the character is transferred to the S-register and is serialized to the communication line.

During receiving operations, the character is received in the S-register and transferred to the 1B-register. Again, because the control clock is not allowed to run, the character remains in 1B. When the CE presses the Cycle pushbutton, the character transfers to the 2B-register and then to the I/O device. By this method, the CE can observe each character in the 1B-register to determine accuracy of the character. Furthermore, the CE can observe the mode changes for the record-checking and/or station-control features.

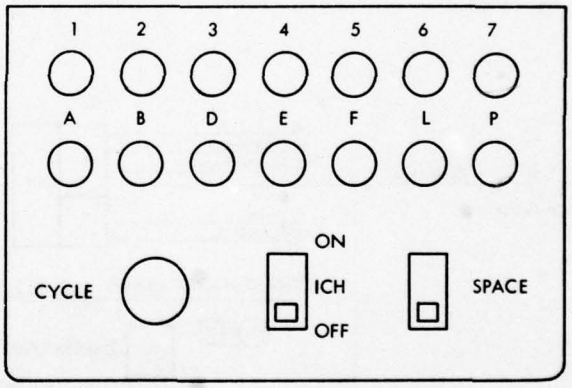


Figure 6-1. CE Aid Box

Figure 6-2 shows the single-cycle circuit. With the 1CH switch at ON, the '1 cycle halt' line is activates the single-cycle circuit. In a sending operation, when '*strobe' and 'strobe O' come up, an AND is conditioned to turn on the 'stop clock' trigger. 'Stop clock' degates the 18 kc oscillator inputs to the control-clock triggers and stops the serdes clock. For the control clock and serdes clock to run, the CE must press the cycle pushbutton. This causes 'cycle N/O' to come up to turn on the 'cycle' trigger. The 'cycle trigger' (on) and the 'cycle interlock' latch (off) condition an AND to bring up 'stop clock reset gate.' 'Stop clock reset gate' turns off the 'stop clock' trigger. The 'stop clock' trigger (off) and the 'cycle N/O' line (still up) turn on the 'cycle interlock' latch. 'Cycle interlock' degates 'stop clock reset gate,' to prevent the 'stop clock' trigger from turning off until the cycle pushbutton is released. When the CE releases the Cycle pushbutton, 'cycle N/ C ' comes up and turns off the 'cycle' trigger and the 'cycle interlock' latch.

During receiving operations, when 'C1,' '2B reset,' and 'S register empty' come up (indicating that a character is in 1B), the 'stop clock' trigger turns on. The procedure to cycle the terminal is the same as for the sending operation.

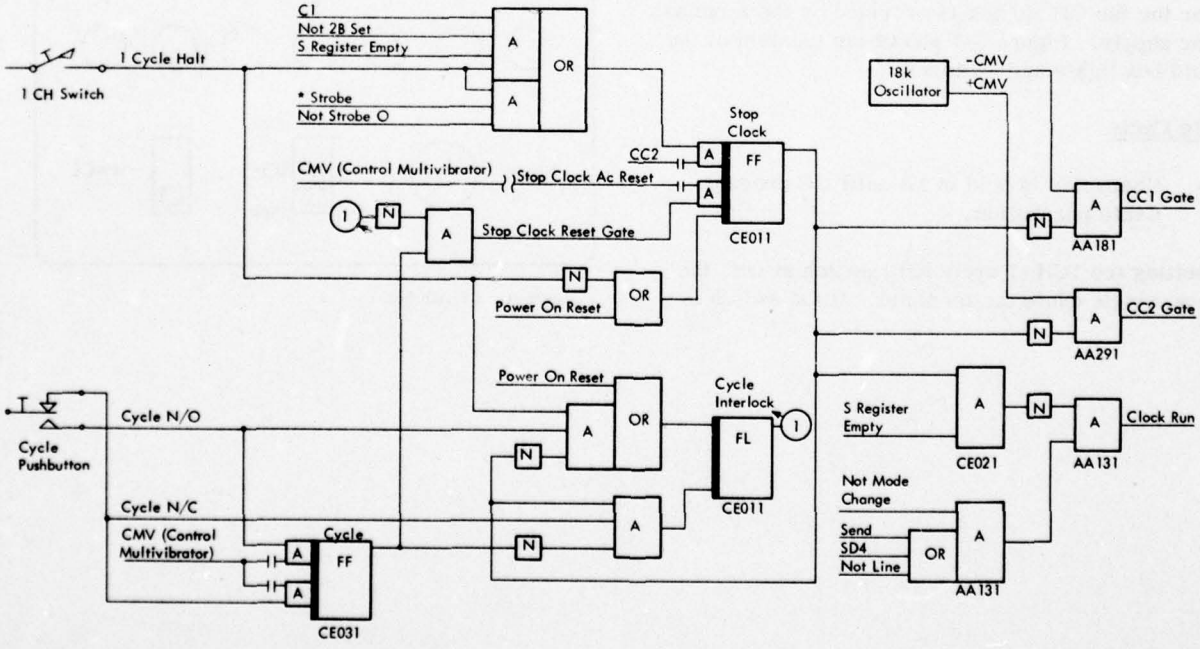


Figure 6-2. Single Cycle

Space Generator

- Continuously loads space characters into the S-register.
- Simulates carrier.
- Blocks power-on reset.

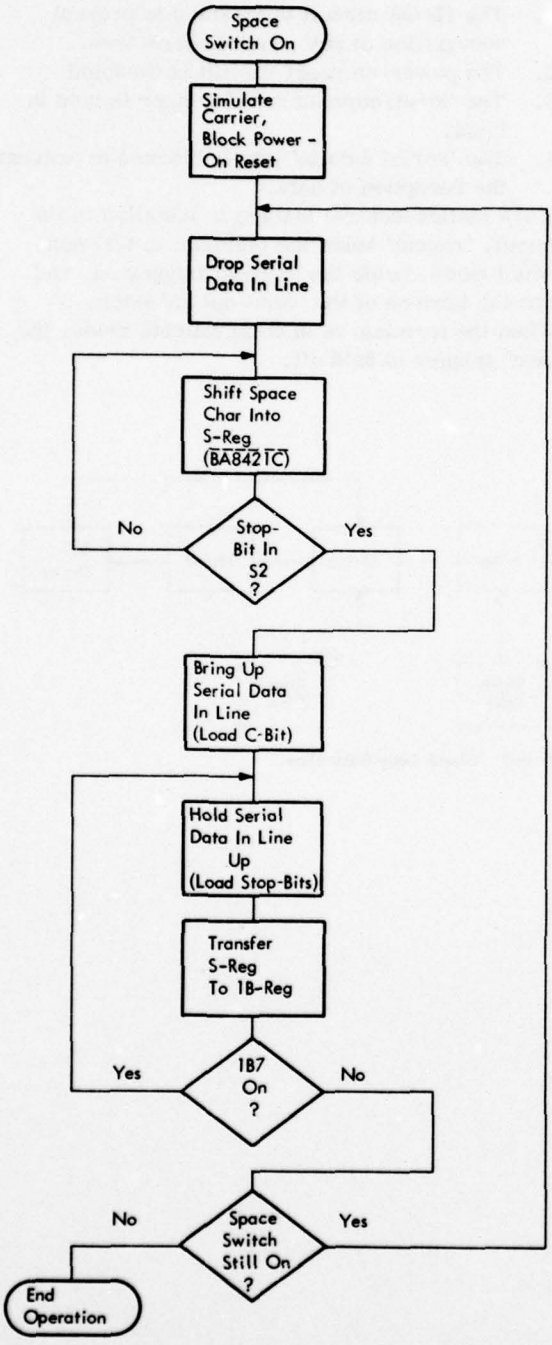


Figure 6-3. Space Generator Flowchart

The space generator continuously simulates space characters (C-bit only) on the 'serial data in' line. Thus the CE can check the operation of the terminal and I/O device, while it is in receive mode, without using another terminal. Figure 6-3 shows the space-generator sequence. Figure 6-4 shows the logic that generates the space character.

Normally, the 'received data line' from the line adapter is in a "marking" or up condition when data is not being received. An AND, conditioned by 'received data' and 'not space N/O,' is the source of the 'serial data in' line. When the CE turns on the space switch, the AND is deconditioned and the 'serial data in' line drops. 'Serial data in' dropping simulates a start bit and starts the serdes clock.

The S-register loads with no-bits until the start bit reaches S2. When the start bit reaches S2, 'not S2' brings up the 'serial data in' line. With the start bit in S2, the timing is such that when the 'serial data in' line comes up, a C-bit is loaded into the S-register. The next bit shifted into S2 is a no-bit; therefore, the 'serial data in' line remains up and loads the stop bit.

Once the complete character is in the S-register, the character transfers to 1B and '1B7' comes up. '1B7' continues to hold the 'serial data in' line up. When the character in 1B transfers to 2B, '1B7' drops and the loading of another space character begins. The '1B7' input prevents the terminal from generating spaces at a faster rate than the I/O device can handle them. Also, when the CE turns on the Space switch, 'space N/O' coming up simulates carrier. The simulated carrier allows the terminal to operate in receive mode without line-adapter carrier. 'Space N/O' also blocks the power-on reset circuit.

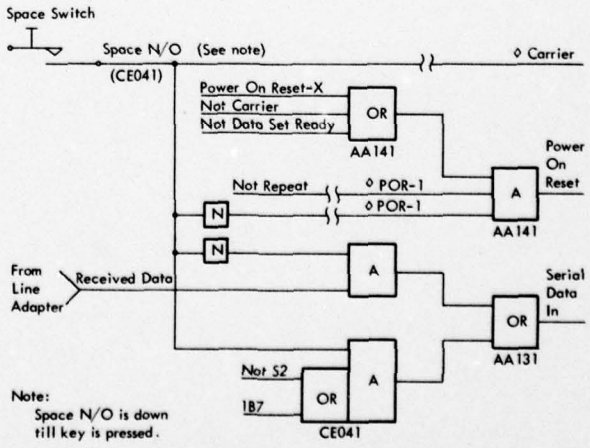


Figure 6-4. Space Generator

CHECK LOOP

- Permits the I/O device to be checked dynamically off-line.
- The strobe circuit is forced up to gate the transmit contacts to 1B.
- '2B set' is forced up to transfer 1B to 2B.
- The character in 2B then restarts the I/O device.

The check-loop circuit allows the CE to check the I/O device off-line. To check the I/O device, the CE causes the I/O device to repeatedly print any I/O character or perform any I/O function except shift. When the CE presses the Bid key on the 2740 or the Attention key on the 2741 while the terminal is in local mode , the check-loop circuit is activated. Pressing any other key on the I/O keyboard causes the character to be printed or the function to be performed continuously until the Bid key is released. Data flow is shown on Figure 6-5.

When 'not send,' 'not clock run,' '1B empty,' and 'local' are up, pressing the Bid key turns on the 'repeat' trigger (Figure 6-6). Before the 'repeat' trigger comes on, the 1B-register is reset by 'mode change,' which is forced up by 'not repeat,' 'not send,' 'local,' and 'bid 1.' Pressing an I/O key starts the I/O cycle, during which the transmit contacts are set up in the configuration of the character. When the 'strobe N/O' contacts make, the 'strobe O' trigger turns on to start the normal sequence that gates the contents of the transmit contacts to the 1B-register. '1B full' comes up. As soon as '*strobe' drops, the '2B set' trigger turns on to transfer the character to the 2B-register. Just as in a receiving operation, the character in 2B is gated to the I/O magnets, causing the I/O to recycle. To stop the operation, the CE releases the Bid key. When the present cycle ends, the 'repeat' trigger turns off.

During check-loop operation the following occurs:

1. The 1B OK circuit is disabled to prevent recognition of any control characters.
2. The power-on reset circuit is disabled.
3. The 'local/communicate' trigger is held in local.
4. The 'serial data in' line is blocked to prevent the reception of data.

If the station-control feature is installed in the terminal, 'repeat' holds the terminal in text non-selected mode, holds the 'garble' trigger on, and blocks the turn-on of the 'time-out 15' latch.

When the terminal is in communicate mode, the 'repeat' trigger is held off.

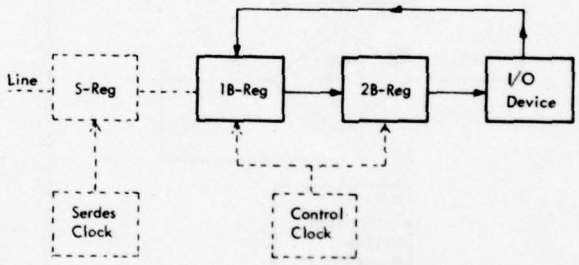


Figure 6-5. Check Loop Data Flow

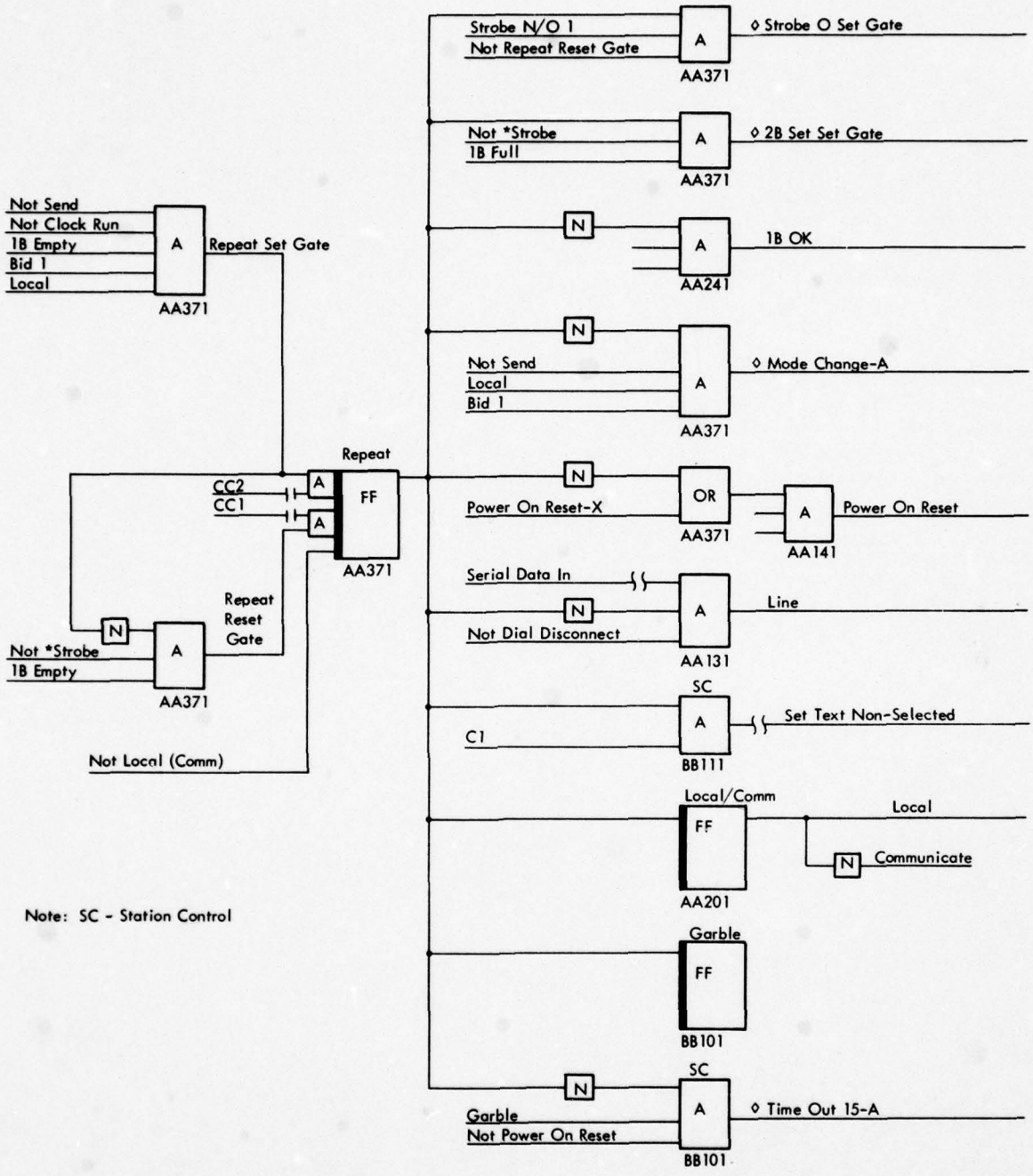


Figure 6-6. Check Loop

APPENDIX A. MACHINE CHARACTERISTICS

Dimensions: Width 28 3/4"
Depth 25 1/4"
Height (Overall) 36 1/2"
Height (Desk-Top) 29"

Maximum Weight: 196 lbs

Service Clearances: Front 30"
Rear 42"
Left 18"
Right 18"

Electrical Requirements:

Voltage	115 or 208/230±10%
Service	15 amps
Frequency	60±1/2
Phases	1
KVA	0.15

Temperature Range:
+50 F. to +100 F

Humidity Range:
10% RH to 80% RH

Maximum Wet Bulb Temperature:
85 F

The 2740/2741 can communicate with other terminals or System/360 over these facilities:

- Common-carrier switched telephone network with Western Electric Data Set 103A (or equivalent).
- Common-carrier switched 150-baud teletypewriter exchange (TWX) network with Western Electric Data Set 103A (or equivalent).
- Common-carrier leased private-line telephone service with Western Electric Data Set 103F (or equivalent), IBM Leased Line Adapter, or IBM Shared Line Adapter (or equivalents).

  NOTE: Common-carrier data sets and IBM Line Adapters cannot be mixed in the same network.
- Common-carrier leased private-line telegraph service (telephone company 150-baud, schedule 3A channel) with appropriate channel termination.
- Western Union Class D (180-baud) channel with Western Union Data Loop Transceiver 1183-A (or equivalent).
- Western Union Class E channel with IBM Leased Line Adapter, or IBM Shared Line Adapter (or equivalents).
- Privately owned communications facilities with other modulator/demodulator equipment similar to IBM Line Adapters or common carrier data sets incorporating the proper interface.
- Local or in-plant customer installed or common-carrier wiring with IBM Limited-Distance Line Adapter Type 1 (for distances up to 4.75 miles) or IBM Limited Distance Line Adapter Type 2 (for distances up to 8.25 miles).

APPENDIX B. SPECIAL CIRCUITS

There are no special circuits used by the 2740/2741 terminal. All circuits are covered in SLT Component Circuits, Form Z22-2798.

* Strobe Trigger 3-5

A Trigger 3-1
Addressing 4-20, 4-22
Addressing Identifier 4-20
Alarm Bell 3-1
All Call Address 4-20
Answering Data Set 4-15
Attention Key 4-27
Auto EOB Trigger 4-14
Auto EOT Trigger 3-19

B Trigger 3-1
BCD-To-I/O Conversion 1-6
Bid Trigger 3-4
Buttons (see Keys)

CA-X Latch 3-14
Carrier-CF 3-17
CC1 2-5
CC2 2-5
Check Switch 4-13
Clear to Send-CB 3-14
Clocks
  Control 2-3, 2-4
  Serdes 2-4
Comm/Local 3-4, 3-19
Contention 4-19
Control Address Mode 4-22
Control Address/Selected Mode 4-22
Control Address/Selected Slave Mode 4-22
Control Characters
  Basic Terminal 3-4
  Record Checking 4-1
  Station Control 4-19
  Transmit Control 4-17
Control Clock 2-5
Control Clock Sequence 2-5
Control Receive Mode 3-1, 4-22
Control Selected Mode 4-24
Control Selected Slave Mode 4-23
Correspondence-to-I/O Conversion 1-7
CR Latch 3-19
Cycle Inlk Latch 6-2
Cycle Pushbutton 6-1
Cycle Trigger 6-2
C1 Trigger 2-5
C2 Trigger 2-5

D Trigger 4-6, 4-22
Data Button 4-15
Data Set Ready-CC 3-13
Data Terminal Ready-CD 3-17, 4-16
Deserialization 2-1
Dial Disc Latch 4-16
Dial Disconnect Key 4-16
Dial-Connect Light 4-15

E Trigger 4-22
End of Block 4-1
End of State Latch 3-6, 4-8, 4-10, 4-25
Enter Serdes Gate Trigger 3-5
Enter Serdes Trigger 3-5
EOB Character 4-1, 4-8
EOB Gate Latch 4-8
EOB Key 4-1
EOB Trigger 4-8
EOT Key 3-4
EOT Trigger 3-4
Error Conditions 4-2
Error Trigger 4-2

F Trigger 4-6, 4-22
Force CR Latch 4-14
Function Decode 2-10

Garble 4-21
Garble Triggers 4-21
Glitch Prot Latch 3-16
Group Address 4-20

Handshaking Procedure 4-15

I/O Cycle Latch 3-8
I/O Motor Control 3-9
IB Latch 4-22
Incorrect Case 3-12
Indicators (See Lights)
Initial Lower Case Latch 3-11
Initial Lowercase 3-9, 3-11
Interface, Terminal To Line Adapter 3-12
Intermediate-Control/Receive Mode 4-17
Intermediate-Polling Mode 4-24
Interrupt Trigger 4-27

Jumpers 4-19, 4-22

Keyboard Lock 3-9
Keyboard Shift-Trip 3-11
Keys
  Attn 4-27
  Bid 3-4
  Dial Disc 4-16
  EOB 4-1
  EOT 3-4
  Loc/Comm 1-2
  Rst 4-11
K1 Relay 3-9

L Trigger 4-6, 4-9

Latches
  CA-X 3-14
  CR 3-19
  Cycle Inlk 6-2
  Dial Disc 4-16
  End of State 3-6, 4-8, 4-10, 4-25
  EOB Gate 4-8
  Force CR 4-14
  Glitch Prot 3-16
  IB 4-22
  Initial Lower Case 3-11
  I/O Cycle 3-8
  Parity Error or Not S8 4-2, 4-9
  Time-Out 1 3-10

Time-Out 15 4-17, 4-22
1B-Register 2-6
2B-Register 2-8
Lights
Bid 3-16
Dial Conn 4-15
Receive 3-2
Restart 4-3
Standby 3-1
Transmit 3-2
Long Function 3-9
LRC Character 4-1, 4-9
LRC Check 4-1
LRC-Register 4-5
LRC-Register Control 4-6

Master 4-19
Mode Change Trigger 3-1
Modes
Control-Address 4-22
Control-Address/Selected 4-22
Control-Address/Selected-Slave 4-22
Control-Receive 3-1, 4-22
Control-Selected 4-24
Control-Selected-Slave 4-23
Intermediate-Control/Receive 4-17
Intermediate-Polling 4-24
Receive-Check/Answerback 4-10
Receive-Control 3-17
Receive-LRC 4-9
Receive-Text 3-1
Receive-Text-Slave 4-23
Text-Non-Selected 4-20, 4-22
Transmit-Check/Answerback 4-10
Transmit-LRC 4-9
Transmit-Poll/Answerback 4-24
Transmit-Status/Answerback 4-22
Transmit-Text 3-1
Transmit-Text/Lock 4-11
Multipoint 1-2, 1-3

Operate Trigger 2-10
Originate-CY 3-17
Originating Data Set 4-15

Parity Error 4-2
Parity Error or Not S8 4-2
Parity Error Trigger 4-2
PE or Not S8 Latch 4-2, 4-9
Point-to-Point 1-2, 1-3
Polling 4-20, 4-24
Power on Reset 3-9
Power Supply 5-1
Print Decode 2-8
Pushbuttons (See Keys)

Receive 3-6
Receive-Check/Answerback Mode 4-10
Receive Control Mode 3-17
Received Data-BB 3-13
Receive-LRC Mode 4-9
Receive-Text Mode 3-1
Receive-Text-Slave Mode 4-23
Record Checking Mode Control 4-6

Registers
1B 2-6
2B 2-8
LRC 4-5
S- 2-1
Relay K1 3-9
Repeat Trigger 6-4
Req to Send Trigger 3-14
Request to Send-CA 3-14
Reset LRC Reg Trigger 4-6
Reset LRC Register 4-6
Restart Key 4-11
Restart Trigger 4-11
Reverse Transmission 4-11

S Reg Empty Trigger 3-5
S-Register 2-1, 2-2
SDAC 2-3
SDCAC1 2-3
SDCAC2 2-3
SD1 Trigger 2-3
SD2 Trigger 2-3
SD3 Trigger 2-3
SD4 Trigger 2-3
Serdes Clock 2-3, 2-4
Serialization 2-1
Set LRC Reg Trigger 4-6
Shift Magnet Armature 3-11
Signal Ground 3-13
Slave 4-19
Space Switch 6-3
Start Bit 1-7
Status Trigger 3-1, 4-16
Stop Bit 1-7
Stop Clock Trigger 6-2
Strobe O Trigger 3-5
Switches
Auto Check 4-13
Transmit Control 4-17

Terminal Address 4-20
Text-Non-Selected Mode 4-20, 4-22
Time-Out 1 Latch 3-10
Time-Out 15 Latch 4-17, 4-22
TOM 2B Reset Trigger 4-28
Transmit 3-1
Transmit-Check/Answerback Mode 4-10
Transmit Control Character Sequence 4-17
Transmit-LRC Mode 4-9
Transmit-Poll/Answerback Mode 4-24
Transmit-Status/Answerback Mode 4-22
Transmit-Text Mode 3-1
Transmit-Test/Lock Mode 4-11
Transmitted Data-BA 3-13
Triggers
* Strobe 3-5
A 3-1
Auto EOB 4-14
Auto EOT 3-19
B 3-1
Bid 3-4
Comm/Local 3-4, 3-19
Cycle 6-2
C1 2-5
C2 2-5

D 4-6, 4-22
E 4-22
Enter Serdes 3-5
Enter Serdes Gate 3-5
EOB 4-8
EOT 3-4
Error 4-2
F 4-6, 4-22
Garble 4-21
Interrupt 4-27
L 4-6, 4-9
LRC-Register 4-5
Mode Change 3-1
Operate 2-10
Parity Error 4-2
Repeat 6-4
Req to Send 3-14
Reset LRC Reg 4-6
Restart 4-11
SD1 2-3
SD2 2-3
SD3 2-3
SD4 2-3
Set LRC Reg 4-6
S-Reg Empty 3-5
S-Register 2-1
Status 3-1, 4-16
Stop Clock 6-2
Strobe O 3-5
TOM 2B Reset 4-28
Type 4-28
2BR 3-8
2B Reset Gate 3-8
2B Set 3-8, 4-10
Type Trigger 4-28
Typamatic Keys 4-28

Voltages 5-1
VRC Check (Parity Check) 4-1, 4-2,

1B Generate 3-4
1B Register 2-6
15-Second Time Delay 4-17
2B Overflow Reset 3-8
1Ch Switch 6-1
2B Overflow Reset 3-8
2B Reset Gate Trigger 3-8
2B Set Trigger 3-8, 4-10
2B Register 2-8
2BR Trigger 3-8

READER'S COMMENT FORM

2740/2741 Communications Terminal Y27-0013-0

- Your comments, accompanied by answers to the following questions, help us produce better publications for your use. If your answer to a question is "No" or requires qualification, please explain in the space provided below. Comments and suggestions become the property of IBM.

	Yes	No
• Does this publication meet your needs?	☐	☐
• Did you find the material:		
Easy to read and understand?	☐	☐
Organized for convenient use?	☐	☐
Complete?	☐	☐
Well illustrated?	☐	☐
Written for your technical level?	☐	☐

- What is your occupation? _____.
- How do you use this publication?

As an introduction to the subject?	☐	As an instructor in a class?	☐
For advanced knowledge of the subject?	☐	As a student in a class?	☐
For information about operating procedures?	☐	As a reference manual?	☐

Other _____.

- Please give specific page and line references with your comments when appropriate. If you wish a reply, be sure to include your name and address.

COMMENTS:

- Thank you for your cooperation. No postage necessary if mailed in the U.S.A.

Staple

Fold

Fold

FIRST CLASS
PERMIT NO. 155
RALEIGH, N. C.

BUSINESS REPLY MAIL
NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY . . .

IBM Corporation
P. O. Box 9592
Raleigh, N. C. 27603

Attention: Product Publications, Dept. 860

Fold

Fold

Cut Along Line

Additional Comments:

IBM

International Business Machines Corporation
Field Engineering Division
112 East Post Road, White Plains, N.Y. 10601

FE
System
Maintenance
Library

System

cut here

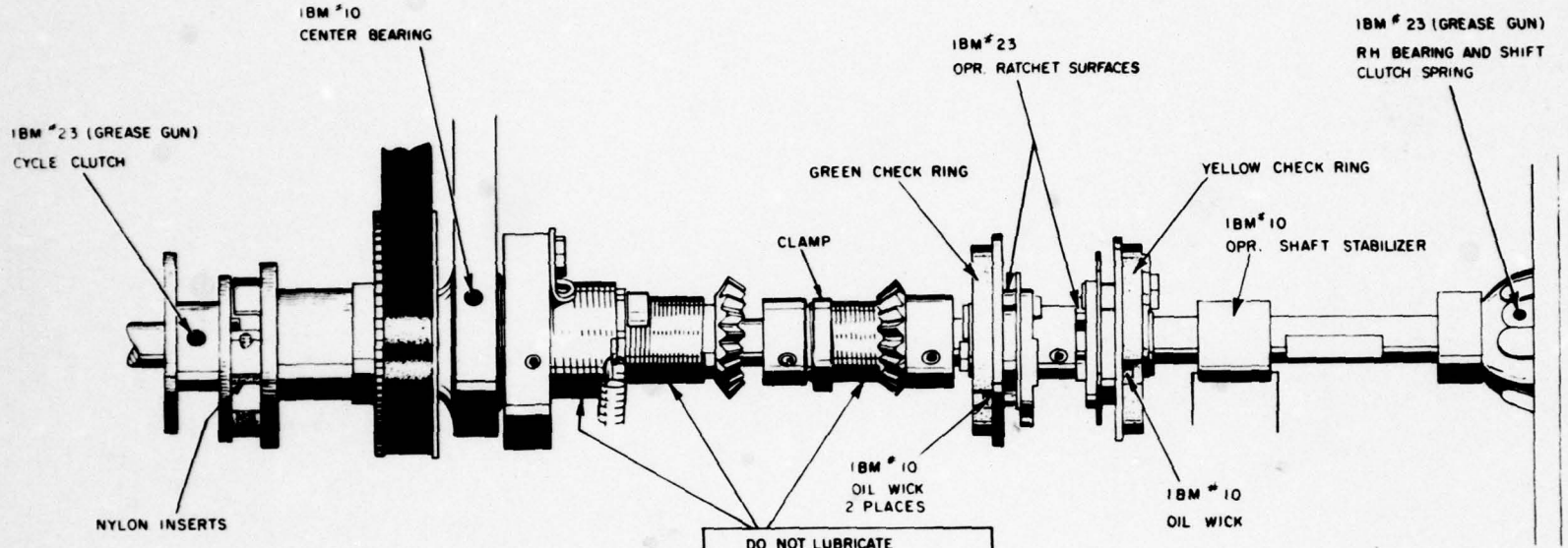
Y27-0013-0

IBM 2740/2741 Printed in U. S. A. Y27-0013-0

IBM

International Business Machines Corporation
Field Engineering Division
112 East Post Road, White Plains, N.Y. 10601

STANDARDS CODE		TECH SERVICES APPRO			SYM	DATE	CHANGE NO	TECH APPRO	SYM	DATE	CHANGE NO	TECH APPRO	DEVELOPMENT NO	Q/M
		ELEC												
RELEASED FOR ASM	QTY	MET												
		PLASTIC												
		FINISH												

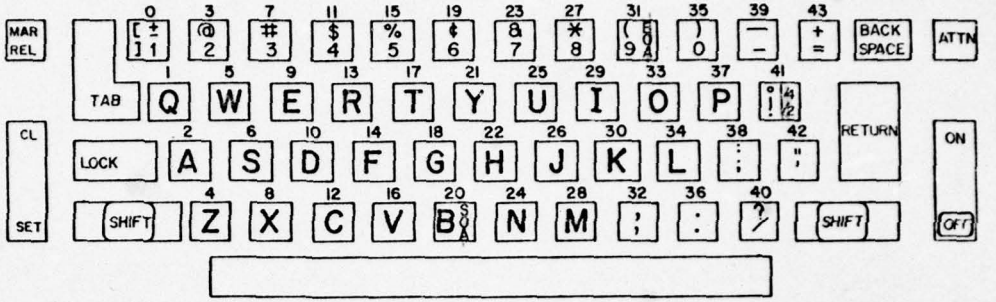


IBM MATERIAL	NO	TOLERANCE UNLESS OTHERWISE NOTED	2 PLACE DEC ±	MUST CONFORM TO ENG SPEC 890350		INTERNATIONAL BUSINESS MACHINES CORP				
			3 PLACE DEC ±	ALIGNMENT WITHIN	NOTE I	NAME	LUBRICATION CHART			
CASE DEPTH			ANGLES ±	CONC TO DU WITHIN	TIR NOTE II	IMPROVED LUBRICATION PRINTER				
HARDNESS				FLAT WITHIN	NOTE III	DESIGN		TYPE		
SURFACE TREATMENT		CORNERS AND / OR EDGES BROKEN	OUTSIDE MAX	PARALLEL TO DU WITHIN	NOTE IV	DETAIL		SCALE	None	
	B		INSIDE MAX	STRAIGHT WITHIN	NOTE V	CHECK		DRAW		
		RADII UNLESS OTHERWISE NOTED		SQUARE TO DU WITHIN	NOTE VI	APPRO		CHECK		

STANDARDS CODE		TECH SERVICES APPRO	SYM	DATE	CHANGE NO	TECH APPRO	SYM	DATE	CHANGE NO	TECH APPRO	DEVELOPMENT NO	Q/M
RELEASED FOR ASM	QTY	ELEC		9-29-65	505702-B						547-8355	1
		MET									1176505	
		PLASTIC										
		FINISH										

1176505

REFERENCE DRAWING



POS	INTERPOSER NO.	CODE NO.	PROJECTIONS REMOVED	85 GRAY BUTTON NO.	R GRAY 1015 BUTTON NO.
0	1138900	0	NONE	1133422	
SP *	1176863	–	4-7	———	
AUX SP *	1176920	–	ALL	———	
1	1138439	39G	1-2-4-5-6-7	1127614	
2	1138404	4G	1-2-6-7	1127965	
3	1138903	3	1-4	1158434	
4	1138446	46G	1-2-3-7	1124905	
5	1138407	7G	1-2-3-4-6-7	1158439	
6	1138906	6	2-3-4-6	1124959	
7	1138405	5G	1-7	1158435	
8	1138419	19G	5-7	1127670	
9	1138411	11G	2-4-5-7	1124962	
10	1138910	10	2-5	1127664	
11	1138911	11	2-3	1124903	
12	1138414	14G	1-2-5-7	1127662	
13	1138913	13	2-6	1127666	
14	1138416	16G	1-5-6-7	1127663	
15	1138915	15	2-4	1133265	
16	1138916	16	1-6	1127619	
17	1138917	17	4-5	1158438	
18	1138918	18	5-6	1127611	
19	1138413	13G	1-2-4-7	1158436	
20	1138422	22G	1-2-3-4-5-7	1127665	1158934
21	1138406	6G	2-3-4-5-6-7	1124963	
22	1138922	22	2-3-4-5	1127661	
23	1138442	42G	2-7	1124900	
24	1138426	26G	1-4-5-7	1127612	
25	1138925	25	1-5	1124960	
26	1138429	29G	4-5-6-7	1133911	
27	1138927	27	1-2	1158437	
28	1138430	30G	6-7	1127617	
29	1138929	29	1-2-4-6	1124964	
30	1138930	30	1-2-4-5	1124957	
31	1138931	31	1-2-3-4	1124904	1158931
32	1138932	32	1-2-5-6	1127615	
33	1138435	35G	2-3-6-7	1124956	
34	1138436	36G	2-3-5-7	1124961	
35	1138425	25G	2-3-4-7	1124904*	
36	1138444	44G	1-4-6-7	1127618	
37	1138937	37	2-4-5-6	1127613	
38	1138403	3G	2-5-6-7	1124958	
39	1138939	39	1-2-3-4-5-6	1127669	
40	1138940	40	2-3-5-6	1127616	
41	1138941	41	4-6	1158441	
42	1138440	40G	2-4-6-7	1127667	
43	1138943	43	1-4-5-6	1127665	

OPERATIONAL BUTTON	KEYLEVER NUMBER	85 GRAY BUTTON NO.	R GRAY 1015 BUTTON NO.
MARGIN RELEASE		1124845	
ATTENTION			1164859
TABULATION		1124890	
TAB. SET & CLEAR		1124875	
SHIFT LOCK		1132266	
SHIFT L.H.		1132259	
SHIFT R.H.		1132252	
CARRIER RETURN		1124870	
SWITCH ON-OFF		1144940	
BACKSPACE		1124450	
SPACEBAR		1124885	

1176505

(KEYBUTTONS TABBED ON 1124446, 1124447, 1124448, 1124449, 1176812)
(INTERPOSERS TABBED ON 1134891, 1134897)
(1159831, & 1159834 ARE OPTIONAL KEYBUTTONS)
TYPE HEAD ASM. NO. 1167050, 1167036

* THESE TWO INTERPOSERS LOCATED IN SAME SLOT IN INTERPOSER GUIDE COMBS

1176505

IBM MATERIAL	NO
CASE DEPTH	
HARDNESS	
SURFACE TREATMENT	

TOLERANCE UNLESS OTHERWISE NOTED	
2 PLACE DEC ±	
3 PLACE DEC ±	
ANGLES ±	
CORNERS AND / OR EDGES BROKEN	OUTSIDE MAX
	INSIDE MAX
RADII UNLESS OTHERWISE NOTED	

C

MUST CONFORM TO ENG SPEC 890350	
ALIGNMENT WITHIN	NOTE I
CONC TO DU WITHIN	TIR NOTE II
FLAT WITHIN	NOTE III
PARALLEL TO DU WITHIN	NOTE IV
STRAIGHT WITHIN	NOTE V
SQUARE TO DU WITHIN	NOTE VI

INTERNATIONAL BUSINESS MACHINES CORP					
NAME	KEYBOARD-GROUP				
CORRES-2741-USA					
DESIGN	BAF 9-15-65	TYPE	835		
DETAIL	BAF 9-15-65	SCALE	NONE		
CHECK	LGC 9-15-65	DRAW	JSA 9-27-65		
APPRO	HST 9-15-65	CHECK	[illegible]		

Selectric Printer for Communication Terminals

S123-1008-5

IBM Parts Catalog

PREFACE

Selectric Printer for Communications Terminals
Illustrated Parts Catalog

S123-1008-5

This Illustrated Parts Catalog (IPC) contains listings and illustrations of all replaceable assemblies, subassemblies, and detail parts released on or before **March 12, 1971 for the Selectric Printers** used with communications terminals:

835-2740
935-2741
2970
1980-9
1980-12
1518

For Communication Terminal Bases and/or Associated Equipment (PARTS CATALOGS) REFER TO:		
a)	1518	Form number 123-1009-
b)	1971-30, 35	Form number 123-0498-
c)	2740/41	Form number 229-9505-
d)	2970	Form number 123-0492-

Sixth Edition (March 1971)

This IBM Selectric Universal I/O Keyboardless Printer Parts Catalog revision, S123-1008-5, obsoletes the previous edition, S123-1008-4.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

This manual has been prepared by the IBM Systems Development Division, Publications Center, Dept. E01, P. O. Box 12275, Research Research Triangle Park, North Carolina 27709.

A form is provided at the back of this publication for reader's comments. If the form has been removed, comments may be sent to the above address.

© International Business Machines Corporation 1970,1971

	FIGURE	PAGE
BACKSPACE MECHANISM	3	12
CABLE AND JUMPER COMPONENTS	59	123
CABLE AND JUMPER COMPONENTS	59	123
CAMSHAFT ASSEMBLY, CHARACTER SELECTION	51	98
CARDHOLDERS	42	79
CARRIER AND ROCKER ASSEMBLIES	36	66
CARRIER RETURN	4	15
CARRIER SUPPORT ASSEMBLY	41	77
CHARACTER SELECTION ASSEMBLY	49	93
CONTROL BUTTONS - 2740, 2970, 1518	55	110
CONTROL BUTTONS - 1980	56	113
CONTROL LIGHTS - 2740, 2970, 1518	55	110
CONTROL LIGHTS - 1980	56	113
CONTACT ASSEMBLY, ATTN. - 2741	20	41
CONTACT ASSEMBLY, C1 & C2 PRINT FEEDBACK	10	29
CONTACT ASSEMBLY, C3 & C4 SHIFT	11	30
CONTACT ASSEMBLY, C5 & C6 PRINT FEEDBACK	12	32
CONTACT ASSEMBLY, C5 & C6 PRINT FEEDBACK 1980	13	33
CONTACT ASSEMBLY, C7 SHIFT PRINT FEEDBACK	14	34
CONTACT ASSEMBLY, CARRIER RETURN INTERLOCK	18	39
CONTACT ASSEMBLY, CARRIER RETURN INTERLOCK 1518 & 2970	19	40
CONTACT ASSEMBLY, KEYBOARD KEYLEVER - 2970	16	36
CONTACT ASSEMBLY, LOCK MECHANISM - 1518	21	42
CONTACT ASSEMBLY, OPERATIONAL TRANSMITTING	7	22
CONTACT ASSEMBLY, SELECTION	17	37
CONTACT ASSEMBLY, SHIFT MODE #1	15	35
CONTACT ASSEMBLY, SPACE AND BACKSPACE, 2741 TYPAMATIC	29	56
CONTACT ASSEMBLY, UNDERSCORE - 2741 TYPAMATIC	30	57
COVER ASSEMBLIES	54	106
DOCUMENT INSERTION ASM	57	115
ESCAPEMENT MECHANISM	53	103
FEED ROLL LOWERING MECHANISM - 1980	35	64
FILTER SHAFT	45	86
INDEXING MECHANISM	2	7
KEYBOARD LOCK MECHANISM	43	81
KEYBOARD SELECTION ASM. - DUAL IMPRESSION	40	75
KEYBOARD SELECTION INHIBITOR	46	88
KEYBOARD SELECTION INTERPOSER	45	86
KEYBOARD SELECTION MECHANISM	44	84
KEYBUTTONS	26	48
LINELOCK BELL MECHANISM	43	81
MAGNET ASM, FEED ROLL CYCLE - 1980	27	53
MAGNET ASM, FEED ROLL LATCH - 1980	28	54
MAGNET ASM, OPERATIONAL	6	20

	FIGURE	PAGE
MAGNET ASM, PRINT SELECTION - EARLY	47	90
MAGNET ASM, PRINT SELECTION - LATE	48	92
MAGNET ASM, R. L. CAM FOLLOWER MTG. BRKT.	25	46
MAGNET ASM, SHIFT	24	45
MAGNET ASM, SHIFT UNLOCK, EARLY 2740/1	22	43
MAGNET ASM, SHIFT UNLOCK, LATE 2740/1	23	44
MARGIN MECHANISM	39	73
MOTOR AND DRIVE MECHANISM	58	120
OPERATIONAL INTERPOSER BRKT. ASM.	5	17
OPERATIONAL SHAFT ASSEMBLY, EARLY STYLE	8	24
OPERATIONAL SHAFT ASM, IMPROVED LUBE	9	26
PAPER FEED	2	7
PLATEN ASSEMBLY, PIN FEED	32	59
PLATEN ASSEMBLY, SPLIT - 1980	33	61
PLATEN ASSEMBLY, STANDARD	31	58
POWER FRAME	53	103
PUSHER ASSEMBLY, SELECTION	50	96
RED RIBBON SHIFT MECHANISM	38	71
RIBBON ASSEMBLY	42	79
RIBBON FEED ASSEMBLY	37	70
ROLL PAPER GUIDE ASM. 2740/1	34	63
SELECTION ASM, CHARACTER	49	93
SHIFT MECHANISM	52	100
SPACE BAR	3	12
SPACE ESCAPEMENT	3	12
TAB MECHANISM	1	1
TYPEHEAD	42	79

(1) **AR**
As Required (AR) in the units per assembly column denotes that the quantity is used as required.

(2) **ATT PT**
Attaching Parts: These parts are used to attach a subassembly to an assembly. The attaching parts are listed immediately following the part to be attached.

(3) **COMM**
Commercial hardware: When this indication appears in the part number column, it denotes hardware procurable from normal commercial sources and not identified by an IBM part number.

(4) **INDENTURE**
The relationship of a part to its next higher assembly is indicated by indentures. For example:

1 2 3 4
Unit
. Assemblies and Detail Parts of Unit
. Attaching Parts for Assemblies & Detail Parts
. . Subassemblies
. . Attaching Parts for Subassemblies
. . . Detail Parts for Subassemblies, etc.

(5) **NR NOT RECOMMENDED FOR REPLACEMENT**
The entry NR in the part number column denotes the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.

(6) **NP**
The entry NP in the part number column denotes the assembly is non-procurable and the detail parts should be ordered separately.

(7) **NO NO.**
When this indication appears in the part number column, it denotes a group of parts for which no assembly part number has been assigned, and the detail parts should be ordered separately.

(8) **REF**
This entry in the units per assembly column denotes an assembly which is completely assembled on a preceding illustration. Quantities for such items are found in its next higher assembly.

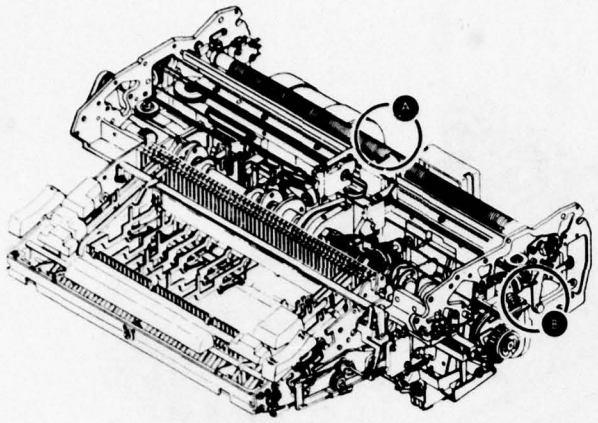
(9) **SIMILAR ASSEMBLIES**
If two assemblies contain a majority of identical parts, they are broken down on the same list. Common parts are shown by one index number. Parts peculiar to one or the other of the assemblies are listed separately and identified by Usable On Code.

(10) **USABLE ON CODE**
Part application and interchangeability is indicated by the usable on code. If this column is blank, the parts pertain to all equipment(s) covered. Two types of codes are used. The alphabetic code denotes similar assemblies and/or features: the numeric code denotes level. Refer to the beginning of each list for the explanation of the code(s).

(11) **SUFFIX CODE**
The suffix code indicates the month (alphabetic) and the year (numeric) of the engineering change which affected interchangeability of the part.

EXAMPLE OF PARTS LIST

LIST AND INDEX NO.	PART NO.	1 2 3 4 DESCRIPTION		UNITS PER ASM.	USABLE ON CODE
		DRIVE MOTOR ASSEMBLY			
2-	(9) (6)	(10) CODE A USED ON 60 CYCLE ONLY (11)		(8)	(10)
		CODE B USED ON 50 CYCLE ONLY			
		CODE 1 USED ON ASM PRIOR TO B6 SUFFIX			
-	2199376 NP	MOTOR ASM,DRIVE-115/220 VOLTS 60 CYCLE		REF	A
-	2199386 NP	MOTOR ASM,DRIVE-220 VOLTS 50 CYCLE		REF	B
		FOR NEXT HIGHER ASM SEE FIGURE 1-92			
		FOR ILLUSTRATION SEE FIGURE 2		(1)	
- 1	2204176 (4)	. PULLEY,60 CYCLE	(2)	1	A
- 1	2199255	. PULLEY,50 CYCLE		1	B
- 2	79842	. SETSCREW,SPLINE DR CUP PT 8-32 X 3/8 LG	ATT PT	AR	
- 3	2204116 (7)	. MOTOR ASM,220V AC 60 CYCLE		1	A
- 4	NO NO.	. MOTOR ASM,220V AC 50 CYCLE		1	B
- 5	5526	. SCREW,MACH BIND HD 8-32 X 0.625 LG	ATT PT	4	
- 6	2204082 (3)	. . FERRULE,OUTER		1	
- 7	2204033	. . FERRULE,INNER		1	
- 8	COMM	. . MOTOR,1/12 HP-220V 60CPS		1	
- 8	2199258 (5)	. . MOTOR,DRIVE - 220V 50CPS		1	
- 9	2199401 NR	. PLATE,MOTOR MT-115/220 VOLTS 60 CYCLE		1	A
- 9	2199402 NR	. PLATE,MOTOR MT-220 VOLTS 50 CYLE		1	B



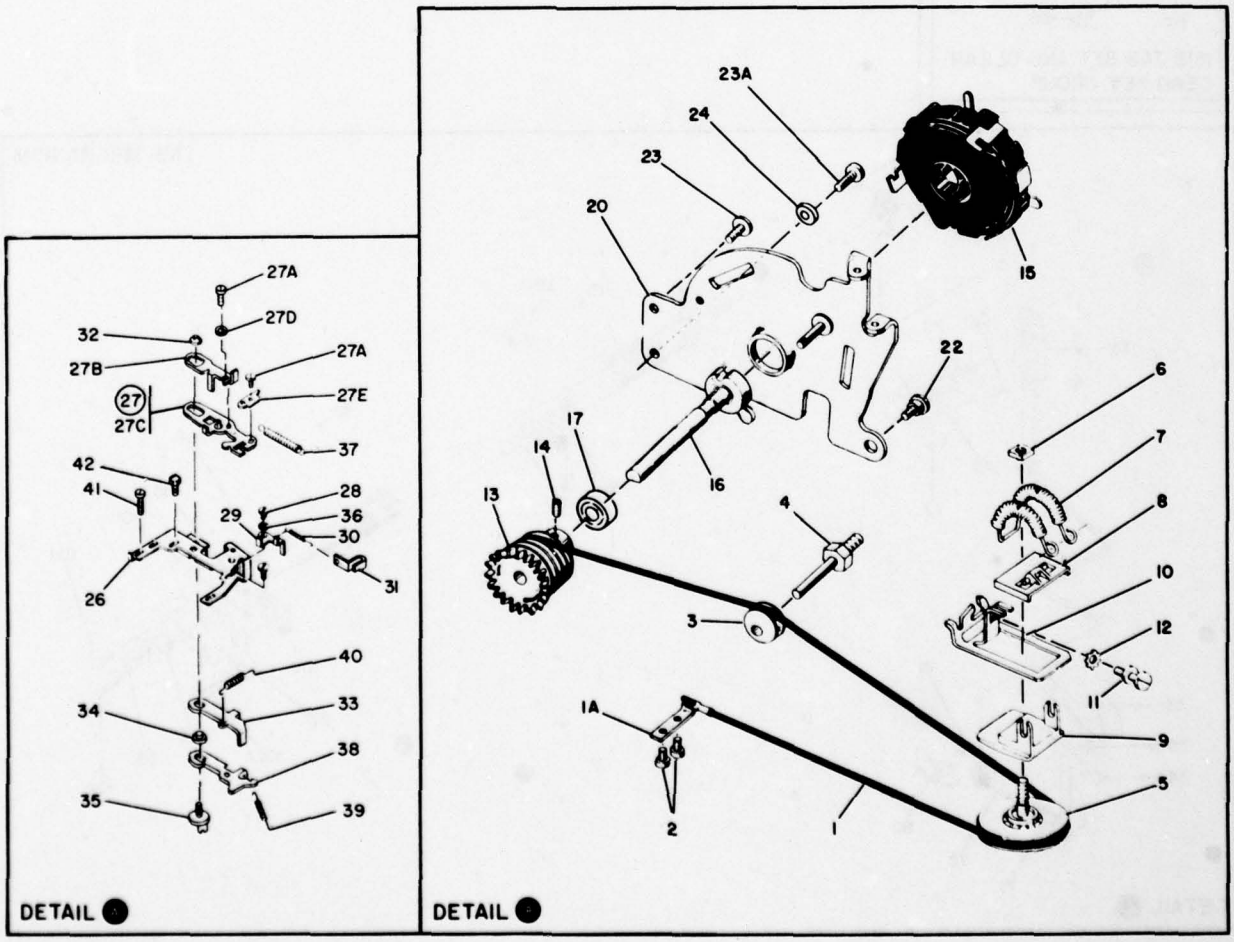
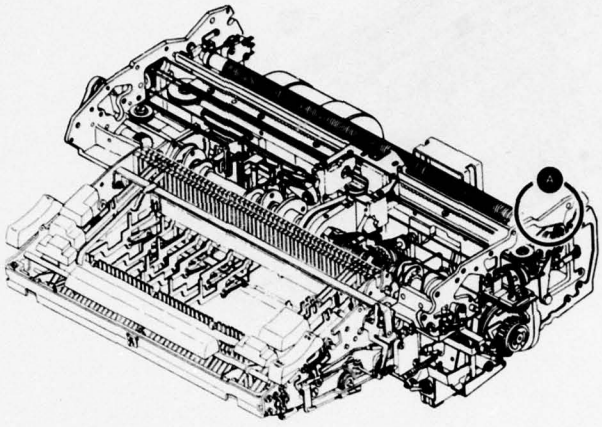
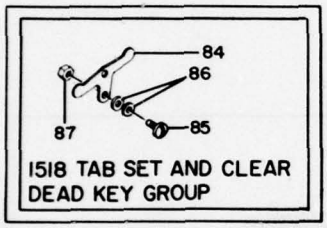


FIGURE 1. TAB MECHANISM ASSEMBLY. SHEET 1 OF 3. SEE LIST 1.





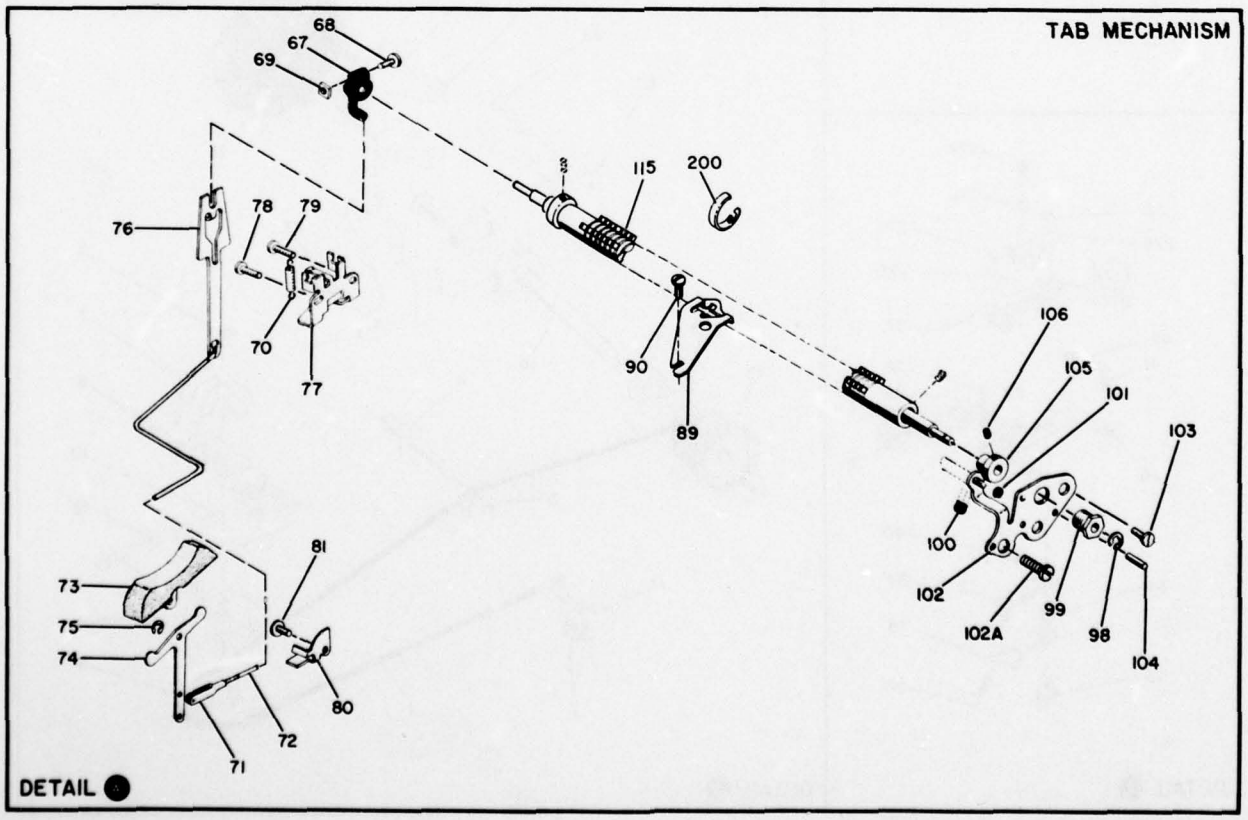
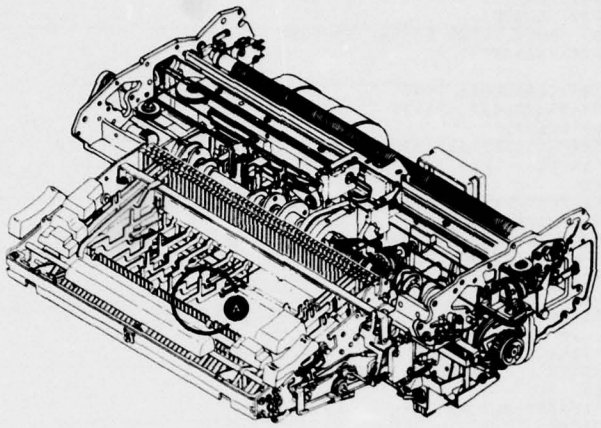
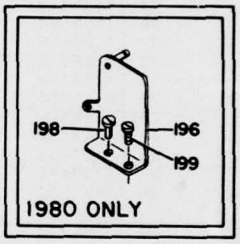


FIGURE 1. TAB MECHANISM ASSEMBLY. SHEET 2 OF 3. SEE LIST 1.





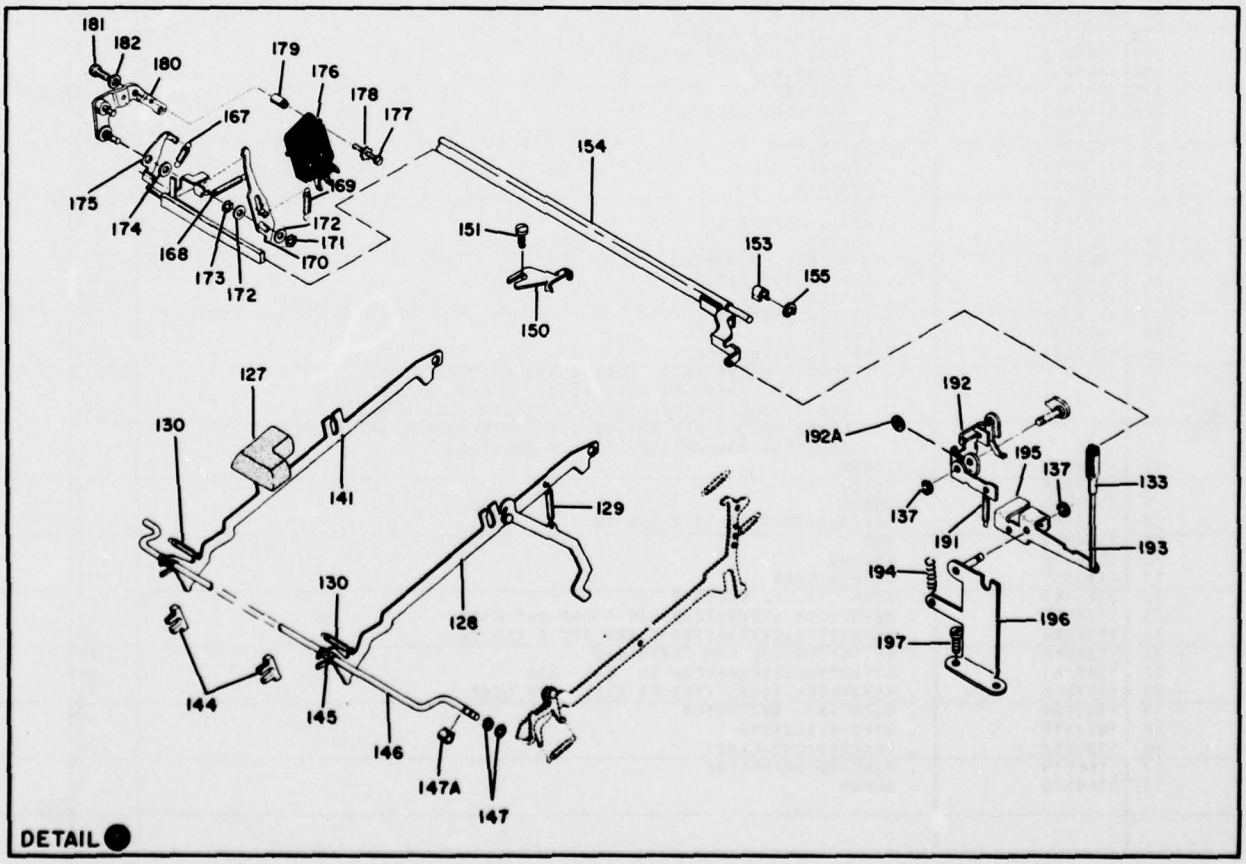


FIGURE 1. TAB MECHANISM ASSEMBLY. SHEET 3 OF 3. SEE LIST 1.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		TAB MECHANISM ASSEMBLY		
1 -	NO NO.	TAB MECHANISM ASSEMBLY SEE FIGURE 1 FOR ILLUSTRATION	NP	
- 1	1166414	. CORD-TAB	1	
- 1A	1124629	. ANCHOR-TAB CORD	1	
- 2	38262	. SCREW,MACH-FIL H 4-40 X 1/4 LG	2	
- 3	1124628	. PULLEY, IDLER	1	
- 4	1124624	. STUD, FRONT IDLER PULLEY SUPPORT	1	
- 5	1124634	. PULLEY-TRANSPORT RH	1	
- 6	1134829	. NUT	1	
- 7	1128387	. SPRING-TRANSPORT LOAD	1	
- 8	1128386	. PIVOT-TRANSPORT SPRING	1	
- 9	1128385	. SLIDE-PULLEY	1	
- 10	1141975	. BRACKET-PULLEY AND SPRING RH INDEX 5 THRU 10 AVAILABLE ON FBM 1280081	1	
- 11	1141936	. SCREW	1	
- 12	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	1	
- 13	1128108	. DRUM-ESCAPEMENT CORD	1	
- 14	1100523	. SETSCREW-SPLINE DR CUP PT 6-32 X 3/16 LG	1	
- 15	1164342	. GAGE-MAIN SPRING	1	
- 16	1164561	. SHAFT-ESCAPEMENT 10P	1	
- 17	1124506	. BEARING, ESCAPEMENT SHAFT	1	
- 20	1128368	. PLATE,BACK	1	
- 22	1127733	. SCREW,MACH-SLTD HD 6-32 X 1/4 LG	1	
- 23	1141846	. SCREW,MACH-BINDING HD 6-32 X 0.375 LG	2	
- 23A	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG	1	
- 24	1141678	. SPACER	1	
- 25	1187435	. ESCAPEMENT BRACKET ASM	1	
- 26	1148310	. . BRACKET	1	
- 26	1141532	. . BRACKET, BELOW S/N 4644763 EXCEPT 1518 SEE NOTE BELOW INDEX 40	1	
- 26	1166714	. . BRACKET, EARLY STYLE 1518 SEE NOTE BELOW INDEX 40	1	
- 27	1187429	. . LEVER ASM	1	
- 27A	1138802	. . . SCREW,TAB PAWL	2	
- 27B	1187428	. . . LEVER,ESCAPEMENT PAWL	1	
- 27C	1187426	. . . LEVER,TAB	1	
- 27D	1141371	. . . SPACER	1	
- 27E	1187427	. . . PAWL,TAB LEVER	1	
- 28	113208C	. . SCREW	1	
- 29	1145516	. . LATCH,TAB	1	
- 30	1166516	. . SPRING	1	
- 31	1166517	. . BRACKET	1	
- 32	1187432	. . NUT	1	
- 33	1187433	. . PAWL,BACKSPACE	1	
- 34	1187404	. . SPACER	1	
- 35	1128301	. . STUD,PAWL MOUNTING	1	
- 36	1132103	. . SPACER,TAB LATCH	1	
- 37	1117376	. . SPRING	1	
- 38	1128201	. . PAWL,ESCAPEMENT	1	
- 39	1187430	. . SPRING	1	
- 40	1187431	. . SPRING,EXTENSION	1	
		NOTE: EARLY LEVEL ESCAPEMENT BRACKET PARTS. WILL NO LONGER BE AVAILABLE. ORDER ENTIRE ASM (INDEX 25) TO CONVERT. ORDER ALSO A NEW STYLE TORQUE BAR INDICE 154 AND RETAINER INDICE 155 AS INTERCHANGABILITY IS NOT POSSIBLE.		
- 41	1187236	. SCREW	2	
- 42	1127745	. SCREW	2	
- 67	1123526	. CRANK	1	
- 68	1928	. SCREW,MACH-RH 6-32 X 1/2 LG	1	
- 69	1134829	. NUT	1	
- 70	1144150	. SPRING	1	
- 71	1110529	. CLEVIS-LINK	1	
- 72	1141146	. LINK- 15 IN. MACHINE	1	
- 73	1124875	. KEYBUTTON,TYPEWRITER-SET & CLR TAB GRAY	AR	
- 73	1133808	. KEYBUTTON,TYPEWRITER-BLANK SET & CLR TAB	AR	
- 73	1138950	. KEYBUTTON-SET AND CLEAR TAB	AR	
- 73	1187141	. KEYBUTTON,TYPEWRITER-LO TAB EIN	AR	
- 73	1187406	. KEYBUTTON,TYPEWRITER-ON LINE OFF LINE	AR	
- 74	1123520	. BELLCRANK-KEYBUTTON	1	
- 75	1073418	. RING-RETAINING	1	
- 76	1134952	. BRACKET-SET/CLEAR	1	
- 77	1166619	. BRACKET-SET/CLEAR	1	
- 78	1164576	. SCREW	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
1 - 79	1164576	. SCREW	1	
- 80	1127764	. GUIDE	1	
- 81	38351	. SCREW,MACH-FIL HD 6-32 X .312 LG	1	
- 84	1128787	. LEVER USED ONLY ON MACHINES 1518	1	
- 85	38266	. SCREW,MACH-FIL H 4-40 X 1/2 LG USED ONLY ON MACHINES 1518	1	
- 86	1124281	. SPACER USED ONLY ON MACHINES 1518	2	
- 87	257186	. NUT,PLAIN,HEX- 4-40 X 5/16 FL W USED ONLY ON MACHINES 1518	1	
- 89	1141270	. FINGER-TAB CLEAR	1	
- 90	1127745	. SCREW,MACH-FLAT FIL H 4-40 X 0.250 LG	1	
- 98	1132122	. RETAINER	1	
- 99	1124082	. BUSHING, TAB RACK SUPPORT	1	
-100	1141223	. CLIP-TORQUE BAR	1	
-101	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	1	
-102	1166089	. PLATE	1	
-102A	801451	. SCREW AND LOCKWASHER	2	
-103	1164576	. SCREW	1	
-104	1132212	. PIN, ESC BACKPLATE AND TAB RACK PLATE	2	
-105	1203557	. PLUG,TAB RACK, LATE STYLE	1	
-106	1175101	. SETSCREW-SPLINE DR CUP PT 4-40 X 1/8 LG	2	
-115	1187597	. RACK, 10 PITCH LATE STYLE, FRICTION DETENTED	1	
-115	1187595	. RACK,12 PITCH	1	
		LATE STYLE, FRICTION DETENTED NOTE: EARLY TAB RACKS NO LONGER AVAILABLE. ORDER LATE LEVEL RACK ASM. INDEX 115 FOR REPLACEMENT.		
-127	1124890	. KEYBUTTON,TYPEWRITER-TAB GRAY	AR	
-127	1133809	. KEYBUTTON,TYPEWRITER-BLANK TAB	AR	
-127	1187175	. KEYBUTTON,TYPEWRITER-REV INDEX	AR	
-128	1128859	. KEYLEVER ASM-TAB	1	
-129	1071449	. SPRING,HELICAL,EXTENSION	1	
-130	127269	. SPRING,HELICAL,EXTENSION	2	
-133	1070020	. CLEVIS-LINK	4	
-137	1073418	. RING-RETAINING	7	
-141	1128862	. KEYLEVER ASSEMBLY-TAB	1	
-143	1128674	. INTERPOSER ASSEMBLY-TAB	1	
-144	1141269	. SLEEVE-LATE STYLE	2	
-145	1073866	. BUSHING	2	
-146	1128891	. BAIL	1	
-147	1073418	. RING-RETAINING	2	
-147A	1166143	. CLIP-TAB BAIL	1	
-150	1159202	. STOP-OVERTHROW	1	
-151	1187434	. SCREW	1	
-153	1141223	. CLIP-TORQUE BAR	1	
-154	1166713	. BAR ASSEMBLY-TORQUE POWER TAB	1	
-155	1166706	. RETAINER-TORQUE BAR	1	
-167	1073449	. SPRING,TAB LEVER LATCH	1	
-168	1144928	. SPRING-HELICAL EXTENSION	1	
-169	1072703	. SPRING	1	
-170	1159203	. LEVER-TAB SWITCH TRIGGER	1	
-171	1073418	. RING-RETAINING	5	
-172	45639	. WASHER,FL-NO. 4 X 5/16 OD X 0.020 THK	1	
-173	1159205	. CLIP,RETAINER,BOWED	1	
-174	20038	. WASH FT NO 10 X 760 OD	1	
-175	1159204	. LEVER-TAB SWITCH ACTUATING	1	
-176	1159207	. SWITCH	1	
-177	1159209	. SCREW,MACH-BINDING HD 2-56 X 0.562 LG	2	
-178	358509	. WASHER,LK INT TOOTH 0.092 ID X 0.012 THK	2	
-179	1159208	. SPACER- 15 INCH MACHINE	2	
-180	1159194	. BRACKET ASSEMBLY-TAB	1	
-181	1187236	. SCREW	1	
-182	257985	. WASHER,FLAT-NO. 4 X 0.250 OD X 0.028 THK	1	
-191	1116343	. SPRING-HELICAL EXTENSION	1	
-192	1135340	. ARM AND LATCH ASSEMBLY	1	
-192A	1166763	. WICK-OIL	1	
-193	1000223	. LINK, CONNECTING	1	
-194	1074242	. SPRING,HELICAL,EXTENSION	1	
-195	1166301	. LEVER-POWER TAB	1	
-196	1187362	. BRACKET ASSEMBLY-PIVOT STUD USED ONLY ON MACHINES 1980	1	
-196	1135312	. BRACKET ASSEMBLY-PIVOT STUD USED ON ALL MACHINES EXCEPT 1980	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
1-197	1164577	. SCREW,MACH-BINDING HD 6-32 X 0.312 LG USED ON ALL MACHINES EXCEPT 1980	2	
-198	35739	. SCREW,MACH-BIND HD 6-32 X 15/16 LG USED ONLY ON MACHINES 1980	1	
-199	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG USED ONLY ON MACHINES 1980	1	
-200	1275643	. CLIP,TAB STOP (FOR LOOSE TABS ONLY)	AR	

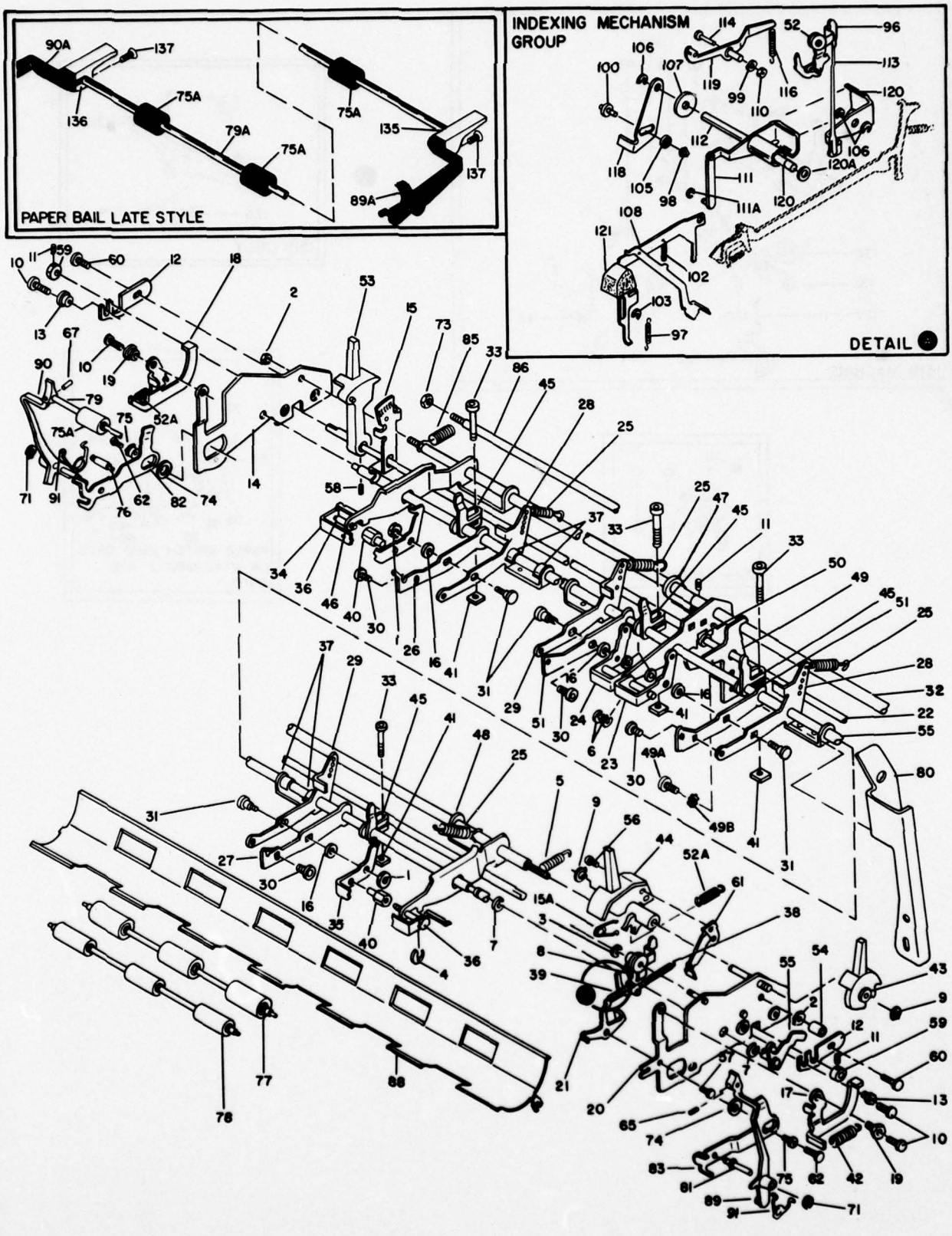
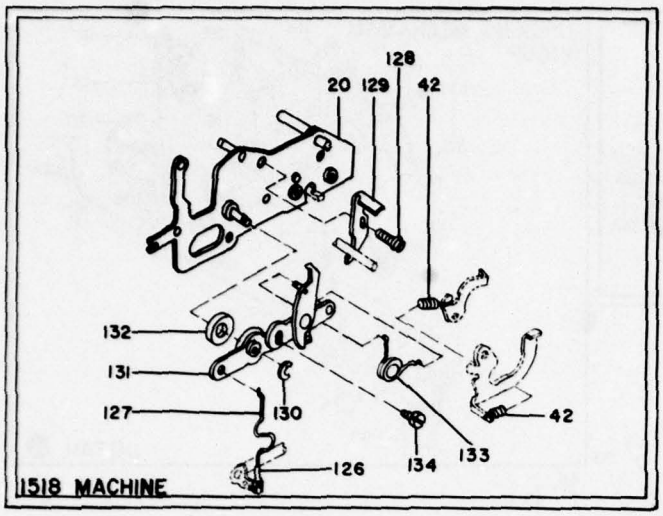
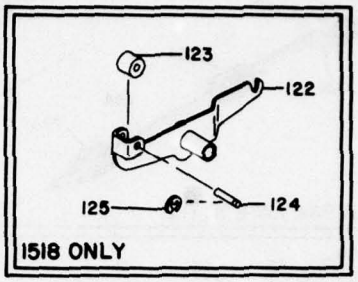
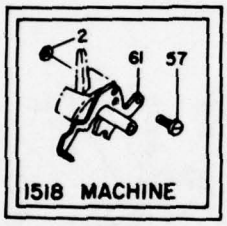


FIGURE 2. PAPER FEED AND INDEXING MECHANISMS. SHEET 1 OF 2. SEE LIST 2.







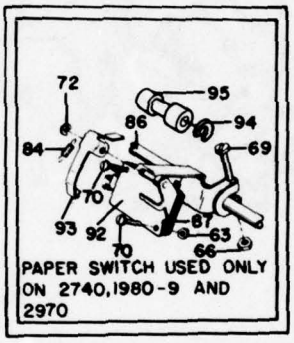


FIGURE 2. PAPER FEED AND INDEXING MECHANISM. SHEET 2 OF 2. SEE LIST 2.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		PAPER FEED AND INDEXING MECHANISMS		
		CODE A USED ON ALL MACHINES EXCEPT 1518,1980 AND 2740-2 DOCUMENT INSERTION CODE B USED ONLY ON MACHINES 1518 CODE C USED ONLY ON MACHINES 1980 AND 2740-2 DOCUMENT INSERTION		
2 -	NO NO.	PAPER FEED MECHANISM SEE FIGURE 2 FOR ILLUSTRATION	NP	A
-	NO NO.	PAPER FEED MECHANISM- 1518 SEE FIGURE 2 FOR ILLUSTRATION	NP	B
-	NO NO.	PAPER FEED MECHANISM- 1980 AND 2740-2 DOCUMENT INSERTION SEE FIGURE 2 FOR ILLUSTRATION	NP	C
- 1	37913	. NUT-HEX 4-40 X .250 ID	4	
- 2	38051	. NUT-FRICTION LATCH MOUNTING	4	B
- 2	38051	. NUT-FRICTION LATCH MOUNTING	2	A
- 3	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK	1	
- 4	364710	. CLIP,GATE ECCENTRIC PIVOT	2	
- 5	1072703	. SPRING	1	
- 6	1073418	. RING-RETAINING	2	
- 7	1103695	. RING,RETAINING-C	2	
- 8	1107795	. SPRING, EXTENSION	1	
- 9	1115633	. RING,RETAINING-EXT 0.181 ID X 0.035 THK	2	
- 10	1115736	. SCREW,MACH-FIL H 6-32 X 0.234 LG	4	
- 11	1175100	. SETSCREW-6 FLUTE DR 8-32 X 3/16 FLAT PT	3	
- 12	1124369	. PLATE	2	
- 13	1124370	. ECCENTRIC	2	
- 14	1124379	. PLATE-CARRIAGE LH	1	
- 15	1124383	. DETENT	1	
- 15A	1124396	. SPRING	1	A
- 16	1124777	. SPACER	4	
- 17	1124801	. LATCH	1	
- 18	1124802	. LATCH	1	
- 19	1124803	. NUT, ECCENTRIC	2	
- 20	1128013	. PLATE ASSEMBLY	1	
- 20	1203625	. PLATE ASM	1	B
- 21	1128017	. STOP, PLATEN OVERTHROW	1	
- 22	1128136	. SHAFT-COPY 15 INCH MACHINE	1	
- 23	1128150	. ARM-REAR CTR LH	1	
- 24	1128151	. ARM-REAR RH CENTER	1	
- 25	1128221	. SPRING-COIL USED ON ALL MACHINES EXCEPT 1980	4	
- 26	1128234	. ARM, LH FEEDROLL ADJ	1	
- 27	1128235	. ARM, RH FEEDROLL ADJ	1	
- 28	1128236	. ARM, FEEDROLL FRONT	2	
- 29	1128237	. ARM, FEEDROLL FRONT	2	
- 30	1128238	. SCREW, CAP, SOC. HD	4	
- 31	1128239	. SCREW, MACHINE	4	
- 32	1128274	. ROD-BASE TIE 15 INCH MACHINE	1	
- 33	1128280	. SCREW, CAP, SOC. HD	4	
- 34	1132218	. ARM, FEEDROLL REAR	1	
- 35	1132219	. ARM, FEEDROLL REAR	1	
- 36	1132222	. SCREW-SPECIAL	2	
- 37	1133593	. CLIP	5	
- 38	1133667	. SPRING,HELICAL,EXTENSION	1	
- 39	1133668	. SPRING-5 UNIT LATCH	1	
- 40	1134773	. STUD	2	
- 41	1134829	. NUT	4	
- 42	1134837	. SPRING-TILT PULL ARM	1	
- 42	126572	. SPRING	1	B
- 43	1135381	. LEVER ASSEMBLY-PAPER RELEASE	1	
- 44	1135456	. LEVER-INDEX SEL	1	
- 44	1128483	. LEVER-INDEX SEL	1	C
- 45	1138118	. LEVER-FEED ROLLER RELEASE	4	
- 46	1141277	. ARM-PAPER FEED MOUNTING LH	1	
- 47	1141282	. ARM-CTR 15 INCH	1	
- 48	1141284	. ARM-RH 15 INCH	1	
- 49	1164698	. BRACKET-SUPPORT USED ON ALL MACHINES EXCEPT 1980	1	
- 49	1141285	. BRACKET-SUPPORT	1	C
- 49A	265195	. SCREW,MACH-HEX HD 6-32 X 7/32 LG USED ON ALL MACHINES EXCEPT 1980	2	
- 49A	1128326	. SCREW,ASM FL WASH-HEX HD 6-32 X 0.310 LG	2	C
- 49B	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	2	
- 50	1164697	. ECCENTRIC-CC CONTROL	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
2 - 51	1141298	. ARM-CTR ADJUSTING 15 INCH MACHINE	2	
- 52	1141595	. CARRIER ASM,INDEX PAWL-54 TEETH	1	B
- 52	1128018	. CARRIER ASM,INDEX PAWL-27 TEETH	1	A
- 52	1128595	. CARRIER ASM,INDEX PAWL-36 TEETH	1	
- 52A	1134837	. SPRING-TILT PULL ARM	1	
		USED ON ALL MACHINES EXCEPT 1980		
- 52A	1145202	. SPRING,HELICAL,EXTENSION	2	C
- 53	1159220	. LEVER ASSEMBLY-COPY CONTROL	1	
- 54	1164160	. STOP-LEVER	1	
- 55	1164499	. SHAFT-FEED ROLL 15 IN.	1	
- 56	1164577	. SCREW,MACH-BINDING HD 6-32 X 0.312 LG	2	B
- 56	1141776	. SCREW,MACH-FIL H 6-32 X 1/4 LG	2	A
- 57	1164582	. SCREW	1	
- 58	1175102	. SETSCREW-6 FLUTE DR 4-40 X 3/16 FLAT PT	2	
- 59	1175236	. ECCENTRIC-COPY CONTROL	2	
- 60	1175237	. SCREW	2	
- 61	1187914	. LEVER,LINE SPACE CAM-54 TOOTH	1	B
- 61	1128477	. LEVER-LINE SPACE CAM	1	C
- 62	38353	SCREW,MACH-FIL H 6-32 X 7/16 LG	2	
- 63	47987	NUT,PLAIN,HEX- 2-56 X 3/16 FL W	2	
- 65	251350	SETSCREW-SPLINE DR FLAT PT 4-40 X 3/32	1	
- 66	257187	NUT,PLAIN,HEX- 6-32 X 3/8 FL W	1	
- 67	264998	PIN,SPRING- 0.069 X 1/4 LG	1	
- 69	322065	SCREW,MACH-BIND HD 6-32 X 5/8 LG	1	
- 70	438541	SCREW,MACH-BIND HD 2-56 X 7/16 LG	2	
- 71	528552	RING,RETAINING-EXT 0.149 ID X 0.031 THK	2	
- 72	1073418	RING-RETAINING	2	
- 73	1091743	NUT,PLAIN,HEX- 1/4-20 X 3/8 FL W	4	
- 74	1124377	SPACER,	2	
- 75	1124378	ECCENTRIC-PLATEN ADJUSTMENT	2	
- 75A	1124397	ROLLER ASSEMBLY-EARLY STYLE	3	
- 75A	1141872	. RCLLER-LATE STYLE	1	
- 76	1124579	PIN	1	
- 77	1128138	ROLLER,FEED-REAR 15 INCH MACHINE	2	
		USED ON ALL MACHINES BUT 1980		
- 77	1187342	FEED RCLL ASSEMBLY-REAR USED ON 1980-9	1	
		USED ON MACHINE 1980-9 ONLY		
- 77	1187346	FEED ROLL ASSEMBLY-REAR USED ON 1980-12	1	
		USED ON MACHINE 1980-12 ONLY		
- 78	1128141	ROLLER,FEED-FRONT 15 INCH MACHINE	2	
		USED ON ALL MACHINES BUT 1980		
- 78	1187343	FEED RCLL ASSEMBLY-FRONT USED ON 1980-9	1	
		USED ON MACHINE 1980-9 ONLY		
- 78	1187345	FEED RCLL ASSEMBLY-FRONT USE ON 1980-12	1	
		USED ON MACHINE 1980-12 ONLY		
- 79	1128152	SHAFT-FAIL 15 INCH MACHINE-.140 O/D-EARLY STYLE	1	
- 79A	1141864	. SHAFT-FAIL 15 INCH MACHINE-.172 O/D-LATE STYLE	1	
- 80	1128278	BRACKET,SUPPORT	1	
- 81	1132055	STUD	2	
- 82	1133589	BRACKET	1	
- 83	1133590	BRACKET	1	
- 84	1134868	SPRING	1	
		USED ONLY ON MACH. 2740, 1980-9 AND 2970		
- 85	1141586	. SPRING	2	
- 86	1159575	. ROD,TIE-BASE	1	
- 87	1160090	SWITCH,PAPER	1	
		USED ONLY ON MACH. 2740, 1980-9 AND 2970		
- 88	1164177	DEFLECTOR ASSEMBLY	1	
		USED ON ALL MACHINES BUT 1980		
- 88	1187299	DEFLECTOR ASSEMBLY-USED ON 1980-9 ONLY	1	
		USED ON MACHINE 1980-9 ONLY		
- 88	1187348	DEFLECTOR ASSEMBLY-USED ON 1980-12 ONLY	1	
		USED ON MACHINE 1980-12 ONLY		
- 89	1164380	LEVER-RH-EARLY STYLE	1	
- 89A	1141865	. LEVER,RH-LATE STYLE	1	
- 90	1164381	ARM,LH-EARLY STYLE	1	
- 90A	1141866	. LEVER,LH-LATE STYLE	1	
- 91	1166544	SPRING-FAIL LEVER	1	
- 92	1176852	BRACKET ASSEMBLY-PAPER SWITCH MTG	1	
		USED ONLY ON MACH. 2740, 1980-9 AND 2970		
- 93	1176855	ARM-PAPER SWITCH	1	
		USED ONLY ON MACH. 2740, 1980-9 AND 2970		
- 94	1176934	RING-RETAINING	2	
- 95	1176935	ROLLER-PAPER FEELER	1	
		USED ONLY ON MACH. 2740, 1980-9 AND 2970		
- 96	1164127	. CLEVIS ASM-INDEX LINK	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
2 - 97	177939	. SPRING,HELICAL,EXTENSION- 30 TURNS	1	
- 98	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL W	1	
- 99	257984	. WASHER,LOCK-SPRING MEDIUM	1	
		ORDER PN 1128975 OR 1138122 AND 1128302 ALSO		
- 99	1127741	. SLEEVE- 0.116 ID X 3/16 OD X 1/32 THK	1	
		USED WITH PINFEED PLATEN ONLY		
-100	340191	. SCREW	1	
-102	1071449	. SPRING,HELICAL,EXTENSION	1	
-103	1073418	. RING-RETAINING	1	
-105	1090622	. WASHER,FLAT- 0.145 ID 0.375 OD 0.040 THK	1	
-106	1092125	. RING-RETAINING	3	
-107	1100688	. WASHER	1	C
-107	1116877	. SPACER	1	
		USED ON ALL MACHINES EXCEPT 1518		
-108	1123984	. KEY LEVER ASSEMBLY	1	
-108	1123996	. KEYLEVER-ATTENTION	1	
-110	1127763	. NUT	1	
-111	1187448	. LINK- 15 INCH MACHINE-(ALSO ORDER INDEX 111A)	1	
-111A	469565	. C-CLIP (USE WITH INDEX 111)	1	
-112	1128081	. SHAFT- 15 INCH MACHINE	1	
-113	1128083	. LINK-INDEX 15 INCH MACHINE	1	
-114	1128302	. SCREW,DETENT LEVER MTG	1	
		ORDER PN 1128975 OR 1138122 OR 1141561		
		AND 257984 OR 1127741 ALSO		
-116	1133663	. SPRING,HELICAL,EXTENSION	1	
-118	1135167	. LEVER, INDEX MULTIPLIER CONTROL	1	
-119	1128975	. INDEX DETENT, PLATEN 36 TOOTH 4+8 LPI	1	
-119	1138122	. INDEX DETENT, PLATEN, 27 TOOTH, 3+6 LPI	1	
-120	1166135	. LEVER ASSEMBLY-INDEX	2	
-120A	1078653	. WASHER	1	
-121	1124850	. KEYBUTTON,TYPEWRITER-INDEX GRAY	AR	
-121	1124854	. KEYBUTTON,TYPEWRITER-INDEX BLUE	AR	
-121	1164859	. KEYBUTTON,TYPEWRITER-ATTN DARK GRAY	AR	
-121	1187139	. KEYBUTTON,TYPEWRITER-INDEX-ZTR GRAY	AR	
-121	1187394	. KEYBUTTON,TYPEWRITER-INDEX-ZTR DARK GRAY	AR	
-122	6512615	. LEVER ASM-DETENT	1	B
-123	6512356	. ROLLER-DETENT	1	B
-124	6512614	. SHAFT-INDEX DETENT ROLLER	1	B
-125	251989	. RING,RETAINING	1	B
-126	1164127	. CLEVIS	1	B
-127	1203644	. LINK	1	B
-128	38261	. SCREW	1	B
-129	1203631	. STOP	1	B
-130	264641	. RETAINER	1	B
-131	1203650	. PAWL AND CARRIER ASSEMBLY	1	B
-132	1203634	. RETAINER	1	B
-133	1172772	. SPRING	1	B
-134	38245	. SCREW	1	B
-135	1141867	. HANDLE-RH	1	
-136	1141868	. HANDLE-LH	1	
-137	1164084	. SCREW	2	

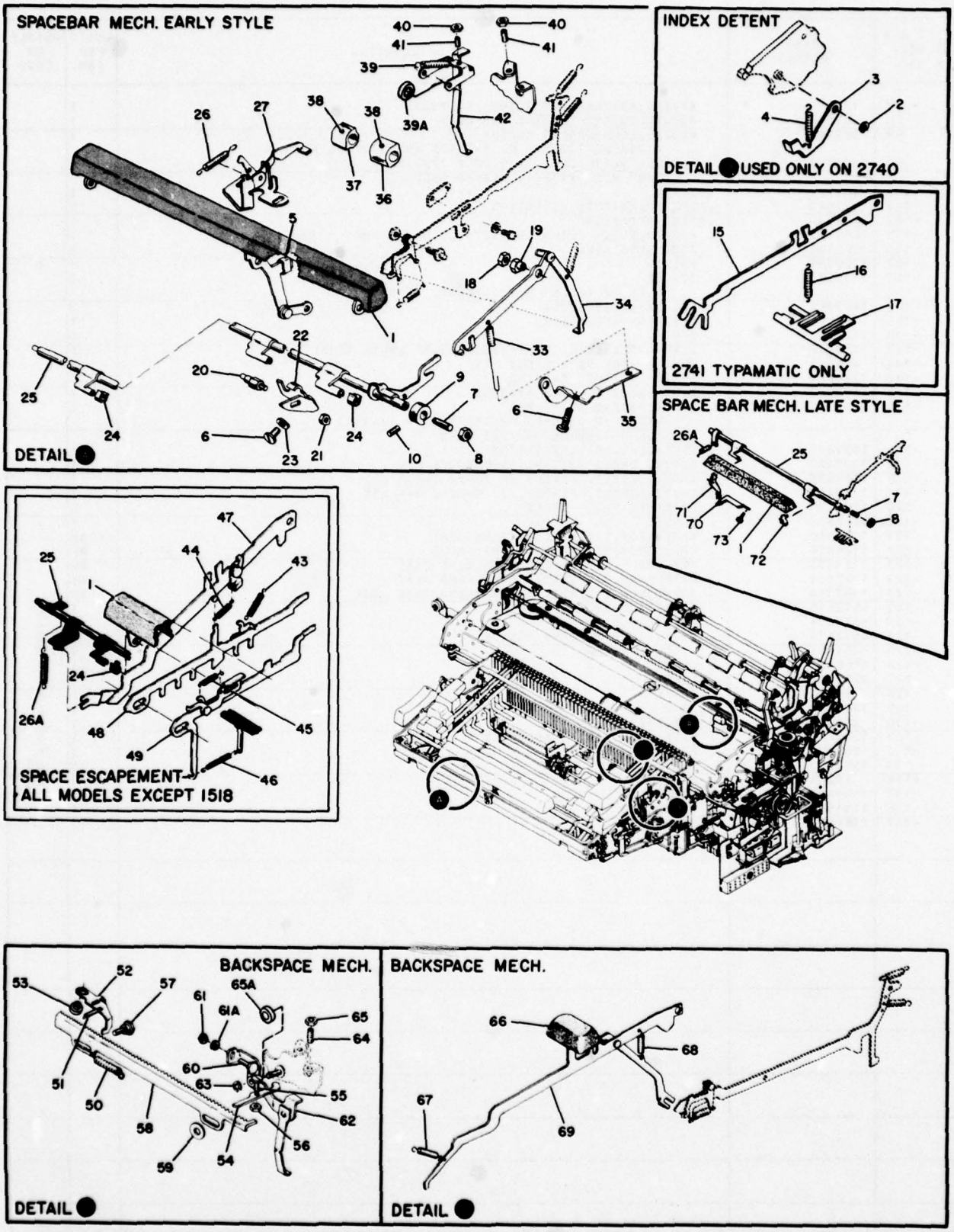


FIGURE 3. SPACEBAR, SPACE ESCAPEMENT AND MECHANISM. SEE LIST 3.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		SPACEBAR, SPACE ESCAPEMENT AND MECHANISM		
		CODE A USED ONLY ON MACHINES 835-2740 CODE B USED ONLY ON MACHINES 735-1518 CODE C USED ON ALL MACH. EXCEPT 735-1518		
		CODE D USED ONLY ON MACHINES 835-2740 AND 935-2741 BELOW SN4647176		
3 -	NO NO.	SPACEBAR, SPACE ESCAPEMENT AND MECHANISM SEE FIGURE 3 FOR ILLUSTRATION	NP	
- 1	1266879	. BAR,SPACE-GRAY	AR	
- 1	1266880	. BAR,SPACE-BLUE	AR	
- 1	1266881	. BAR,SPACE-NAVY BLUE	AR	
- 1	1124885	. BAR,SPACE-GRAY-LATE STYLE	AR	
- 2	1073418	. RING-RETAINING	1	A
- 3	1123997	. ARM	1	A
- 4	1133622	. SPRING-INDEX DETENT	1	A
- 5	1073866	. BUSHING	1	
- 6	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG	2	
- 7	1123987	. SCREW	1	
- 8	38051	. NUT-FRICTION LATCH MOUNTING	1	
- 9	1128883	. COLLAR	1	
- 10	1175101	. SETSCREW-6 FLUTE DR 4-40 X 1/8 CUP PT	1	
- 15	1186033	. KEYLEVER USED ONLY ON MACHINES 2741 TYPAMATIC	1	
- 16	1141838	. SPRING-LEVER RETURN	1	
- 17	1176596	USED ONLY ON MACHINES 2741 TYPAMATIC . BAIL-CBM USED ONLY ON MACHINES 2741 TYPAMATIC	1	
- 18	37913	. NUT-HEX 4-40 X .250 ID	1	B
- 19	1123977	. ECCENTRIC	1	B
- 20	1141106	. STUD	1	
- 21	37913	. NUT-HEX 4-40 X .250 ID	1	
- 22	1141105	. SUPPORT	1	
- 23	1090970	. WASHER,FL-NO. 6 X 3/8 OD X 0.020 THK	2	
- 24	1128270	. RETAINER	2	
- 25	1176594	. SHAFT ASSEMBLY-EARLY STYLE USED ONLY ON MACHINES 2741 TYPAMATIC	1	
- 25	1141103	. SHAFT ASSEMBLY	1	B
- 25	1176906	. SHAFT ASSEMBLY-EARLY STYLE USED ON ALL MACHINES EXCEPT 1518 AND 2741 TYPAMATIC	1	
- 25	1203235	. SHAFT ASM-LATE STYLE	1	
- 25	1203236	. SHAFT ASM-2741 TYPAMATIC-LATE STYLE	1	
- 26	1090343	. SPRING,HELICAL,EXTENSION	1	
- 26A	1090175	. SPRING-ROW 3 & 4	1	
- 27	1138454	. LEVER ASSEMBLY, SB INTERLOCK	1	
- 33	1107794	. SPRING,HELICAL,EXTENSION	1	B
- 34	1128271	. LEVER ASSEMBLY, SPACEBAR	1	B
- 35	1135179	. BRACKET, CONTACT MTG.	1	B
- 35	1134977	. BRACKET-BAIL	1	C
- 36	1164724	. CAM-ESCAPEMENT	1	
- 37	1145478	. CAM-SPACE BAR INTERLOCK	1	
- 38	1175107	. SETSCREW	2	
- 39	1144928	. SPRING-HELICAL EXTENSION	2	
- 39A	1166761	. WICK-CII	1	
- 40	37913	. NUT-HEX 4-40 X .250 ID	2	
- 41	1141071	. SETSCREW-FLUTED DR OVAL PT 4-40 5/16 LG	2	C
- 41	257962	. SETSCREW-FLUTED 4-40	2	B
- 42	1128374	. LATCH ASSEMBLY	1	B
- 42	1128105	. LATCH ASSEMBLY- 15 INCH MACHINE	1	C
- 43	1090175	. SPRING-ROW 1 & 2	1	C
- 44	1132165	. SPRING-COIL	1	C
- 45	1176998	. SPRING-LINE LOCK	1	C
- 46	123552	. SPRING,HELICAL,EXTENSION- 21 TURNS	1	C
- 47	1187223	. KEYLEVER-SPACE BAR	1	C
- 48	1176863	. INTERPOSER-SP BAR	1	C
- 49	1176920	. INTERPOSER-SP AUX	1	C
- 50	58852	. SPRING,HELICAL,EXTENSION- 42 TURNS	1	
- 51	1132064	. SPRING,BS PAWL	1	D
- 52	1187403	. PAWL-BACKSPACE BELOW SN 4650197 REPLACE SPACER ALSO	1	D
- 53	1124094	. SPACER, BS PAWL	1	D
- 53	1187404	. SPACER-BACKSPACE PAWL	1	D
		BELOW SN 4650197 REPLACE ALSO BS PAWL AND COMPLETE LATE STYLE ESCAPEMENT BRACKET		

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
3 - 54	1138799	. LEVER-INTERPOSER 10 PITCH	1	
- 54	1138800	. LEVER-INTERPOSER 12 PITCH	1	
- 55	1124615	. STUD-BACKSPACE INTERMEDIATE LEVER	1	
- 56	37913	. NUT-HEX 4-40 X .250 ID	1	
- 57	1124614	. STUD, BS RACK MTG-EARLY STYLE	5	
- 57	1147335	. STUD,BS RACK MTG-LATE STYLE	3	
- 58	1147320	. RACK,BS-10P-LATE STYLE	1	
- 58	1147319	. RACK,BS-12P-LATE STYLE	1	
- 58	1128025	. RACK-BACKSPACE 10 PITCH-EARLY STYLE	1	
- 58	1128024	. RACK-BACKSPACE 12 PITCH-EARLY STYLE	1	
- 59	1124616	. SPACER, BS RACK	5	
- 60	1124612	. STUD-BS BELLCRANK	1	
- 61	37913	. NUT-HEX 4-40 X .250 ID	1	
- 61A	1166765	. WICK-OIL	1	
- 62	1159485	. LATCH ASSEMBLY	1	
- 63	25282	. RING-RETAINING,EXT 0.125 ID X 0.015 THK	1	
- 64	1141072	. SETSCREW-FLUTED DR OVAL PT 4-40 X 1/2 LG	1	
- 65	37913	. NUT-HEX 4-40 X .250 ID	1	
- 65A	1166671	. OIL WICK	1	
- 66	1124450	. KEYBUTTON,TYPEWRITER-BACK SPACE GRAY	AR	
- 66	1124844	. KEYBUTTON,TYPEWRITER-BACK SPACE BLUE	AR	
- 66	1133811	. KEYBUTTON,TYPEWRITER-BLANK B/S POS	AR	
- 66	1187150	. KEYBUTTON,TYPEWRITER-BKSPACE-RUCK TASTE	AR	
- 67	166623	. SPRING,HELICAL,EXTENSION	1	
- 68	1071449	. SPRING,HELICAL,EXTENSION	1	
- 69	1133686	. KEYLEVER ASSEMBLY-BACKSPACE	1	
- 70	1203229	. GUIDE,SPACE BAR	1	
- 71	1203230	. STEM,SPACEBAR-LH	1	
- 72	1134899	. STEM,SPACEBAR-RH	1	
- 73	1138974	. SCREW	2	

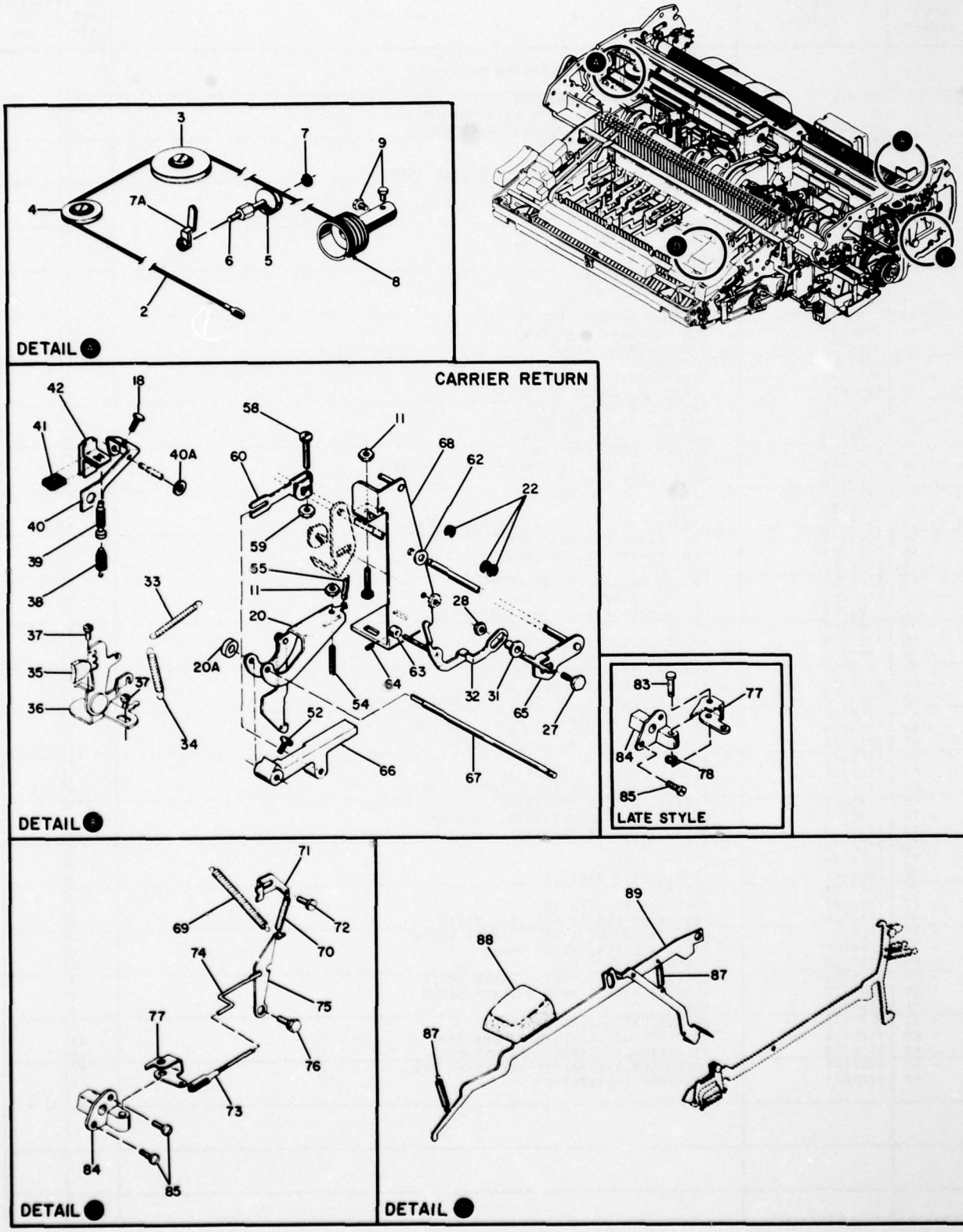
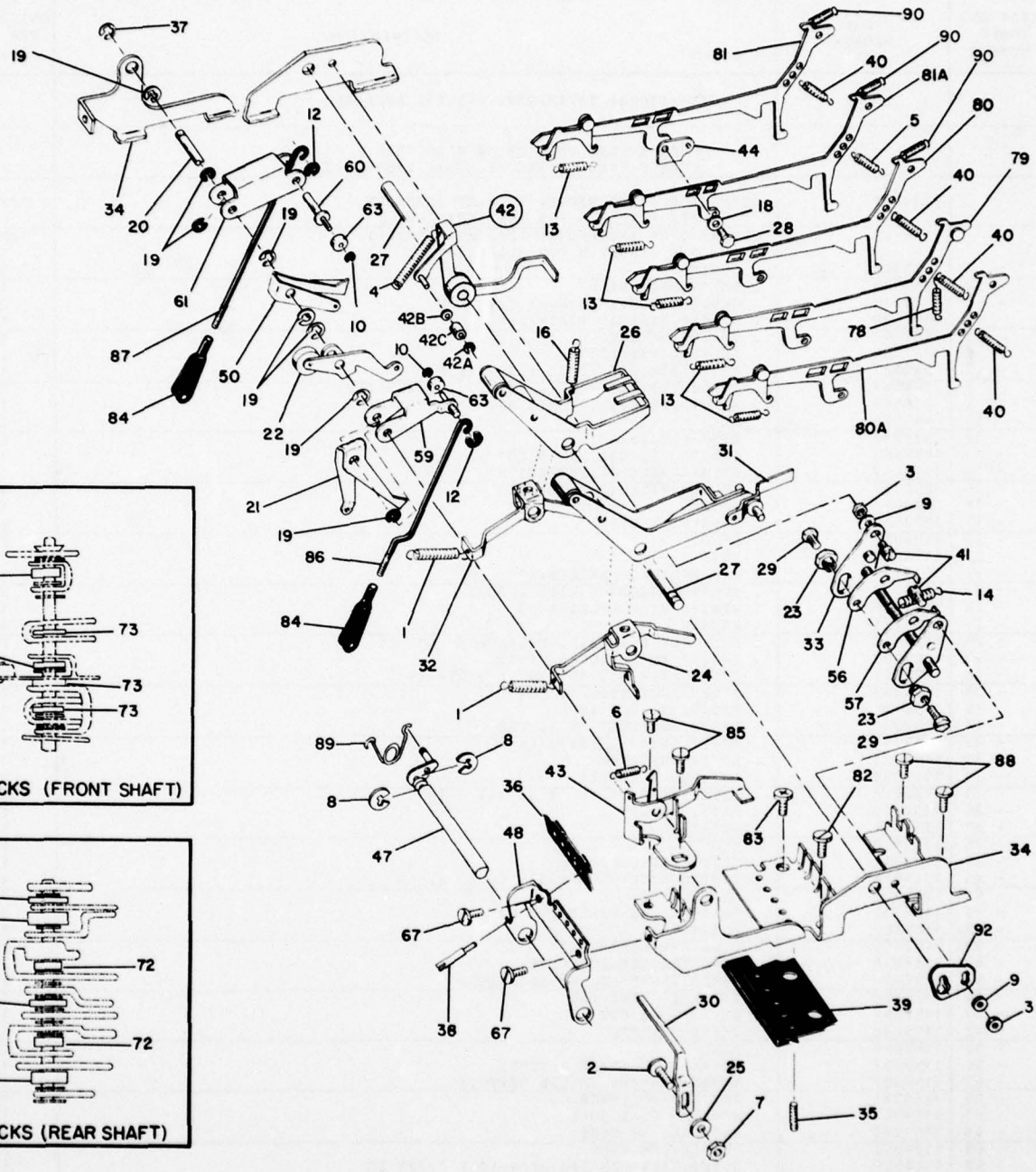
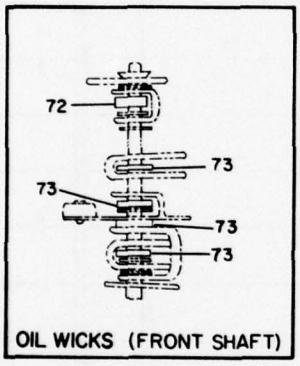


FIGURE 4. CARRIER RETURN. SEE LIST 4.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		CARRIER RETURN MECHANISM		
4 -	NO NO.	CARRIER RETURN MECHANISM SEE FIGURE 4 FOR ILLUSTRATION	NP	
- 1	NO NO.	. MOTOR AND DRIVE MECHANISM GROUPS	NP	
- 2	1166415	. CORD-CARRIER RETURN	1	
- 3	1124567	. PULLEY-BALL BEARING USED ON ALL MACHINES EXCEPT 1518	1	
- 3	1164187	. PULLEY USED ONLY ON MACHINES 1518	1	
- 4	1124638	. PULLEY, BALL BRG LH	1	
- 5	1124628	. PULLEY, IDLER	1	
- 6	1175199	. STUD-REAR IDLER PULLEY	1	
- 7	1073418	. RING-RETAINING	1	
- 7A	1175198	. STOP-TORQUE BAR	1	
- 8	1124463	. DRUM, CBM CORD	1	
- 9	1145479	. SCREW	2	
- 11	37913	. NUT-HEX 4-40 X .250 ID	3	
- 18	1124775	. SCREW, SHIFT ARM STOP	1	
- 20	1166214	. ARM ASSEMBLY-LATCH	1	
- 20A	1187006	. WICK-OIL	1	
- 22	1092125	. RING-RETAINING	7	
- 27	1124610	. STUD, CR CLUTCH ECCENTRIC	1	
- 28	37913	. NUT-HEX 4-40 X .250 ID	1	
- 31	1128169	. SPACER, CR CLUTCH LATCH	1	
- 32	1159327	. ARM-CR LATCH ACTUATING	1	
- 33	1128325	. SPRING-ACTUATING ARM	1	
- 34	43373	. SPRING,HELICAL,EXTENSION- 26.5 TURNS	1	
- 35	1128338	. SHOE-CARRIER RETURN	1	
- 36	1132003	. ARM ASM, CR ACTUATING	1	
- 37	1164576	. SCREW	2	
- 38	1141172	. SPRING-CARRIER RETURN ACTUATOR ARM	1	
- 39	1141173	. STUD-CARRIER RETURN ARM	1	
- 40	1141245	. ARM-CARRIER RETURN CLUTCH	1	
- 40A	1166762	. WICK-OIL	1	
- 41	1164795	. INSERT-CARRIER RETAINER CLIP	1	
- 42	1141290	. CLIP-CARRIER RETURN ARM	1	
- 52	38263	. SCREW,MACH-FIL H 4-40 X 5/16 LG	1	
- 54	1159286	. SCREW	1	
- 55	1100937	. SPRING,HELICAL,EXTENSION	1	
- 58	322065	. SCREW,MACH-BIND HD 6-32 X 5/8 LG	1	
- 59	38051	. NUT-FRICTION LATCH MOUNTING	1	
- 60	1159335	. ARM-INT CR LAT ACTUATING	1	
- 62	1090336	. WASHER,FLAT- 0.193 ID 0.438 OD 0.010 THK	1	
- 63	1159336	. COLLAR-OPERATIONAL SHAFT	1	
- 64	1175101	. SETSCREW-6 FLUTE DR 4-40 X 1/8 CUP PT	1	
- 65	1159818	. LATCH ASSEMBLY-CARRIER RETURN	1	
- 66	1166212	. LEVER ASM	1	
- 67	1159334	. PIN-OPERATIONAL PIVOT LH	1	
- 68	1159321	. BRACKET ASSEMBLY-IND TRANSFER SHIFT	1	
- 69	1115017	. SPRING,HELICAL,EXTENSION	1	
- 70	150735	. SPRING,HELICAL,EXTENSION 35 TURNS	1	
- 71	1127737	. LOCK, TAB RACK BUSHING	1	
- 72	1128113	. STUD, TRIGGER	1	
- 73	1070020	. CLEVIS-LINK	1	
- 74	1164171	. LINK-CLUTCH UNLATCH	1	
- 75	1123631	. KEEPER	1	
- 76	1123629	. STUD-CAR RET KEEPER	1	
- 77	1174106	. BELLCRANK-CLUTCH UNL,LATE STYLE	1	
- 77	1128397	. BELLCRANK-CLUTCH UNL - EARLY STYLE	1	
- 78	264641	. RING,RETAINER, EARLY STYLE	1	
- 83	1141228	. BSTUD,EARLY STYLE	1	
- 84	1141231	. BUSHING,MARGIN RACK - EARLY STYLE	1	
- 84	1203527	. BUSHING-MARGIN RACK RH,LATE STYLE	1	
- 85	1164582	. SCREW	2	
- 87	1071449	. SPRING,HELICAL,EXTENSION	1	
- 88	1124870	. KEYBUTTON,TYPEWRITER-RETURN GRAY	AR	
- 88	1124874	. KEYBUTTON,TYPEWRITER-RETURN BLUE	AR	
- 88	1187146	. KEYBUTTON,TYPEWRITER-RETURN-WR ZTR	AR	
- 89	1133681	. KEYLEVER ASSEMBLY-CR	1	





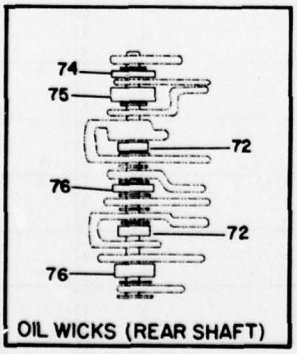


FIGURE 5. OPERATIONAL INTERPOSER BRACKET ASSEMBLY. SEE LIST 5.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		OPERATIONAL INTERPOSER BRACKET ASSEMBLY		
5 -		CODE A USED ONLY ON MACHINE 1518 CODE B USED ON ALL MACHINES EXCEPT 1518		
-	1135408	OPERATIONAL INTERPOSER BRACKET ASSEMBLY SEE FIGURE 5 FOR ILLUSTRATION	REF	A
-	1176807	OPERATIONAL INTERPOSER BRACKET ASSEMBLY SEE FIGURE 5 FOR ILLUSTRATION	REF	B
- 1	23106	. SPRING	2	
- 2	1115734	. SCREW,PAWL STOP	1	A
- 3	38214	. NUT,PLAIN,HEX- 4-40 X 1/4 PL W	2	
- 4	1091618	. SPRING,HELICAL,EXTENSION	1	
- 5	150047	. SPRING,DETENT	1	A
- 6	167790	. SPRING, EXTENSION	1	A
- 7	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 PL W	1	A
- 8	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK	2	
- 9	338169	. WASHER,LOCK-EXT TEETH NO. 4 X .260 OD	1	
- 10	469565	. CLIP	2	
- 12	1073418	. RING-RETAINING	2	
- 13	1073863	. SPRING,HELICAL,EXTENSION	4	
- 14	1074242	. SPRING,HELICAL,EXTENSION	1	
- 16	1090162	. SPRING,HELICAL,EXTENSION	1	
- 18	1090472	. WASHER	1	A
- 19	1092125	. RING-RETAINING	9	
- 20	115996C	. STUD	1	A
- 21	1174207	. PAWL	1	
- 22	1123591	. CAM FOLLOWER ASSEMBLY	1	
- 23	1123593	. ECCENTRIC,CHECK RING ADJUST	2	
- 24	1123819	. ARM, CLUTCH RELEASE RH	1	
- 25	1124461	. WASHER	1	
- 26	1124508	. FOLLOWER ASSEMBLY, BACKSPACE CAM	1	
- 27	1187193	. SHAFT-CAM FOLLOWER PIVOT	1	
- 28	1127714	. SCREW,MACH-HEX HD 3-48 X 0.034 LG	1	A
- 29	1166343	. SCREW-ECCENTRIC ADJUST	2	
- 30	1138108	. STOP-KEYLEVER PAWL	1	
- 31	1187030	. LEVER ASSEMBLY, C.R. CAM	1	
- 32	1187195	. ARM, CLUTCH RELEASE LH	1	
- 33	1159301	. LEVER-RESTORE	1	
- 34	1132084	. BRACKET ASSEMBLY	1	
- 35	1132098	. SETSCREW-HEADLESS 4-40 X 3/8 LG	4	
- 36	1132117	. CLIP, SPEED	1	
- 37	1132122	. RETAINER	1	
- 38	1133584	. STUD	4	
- 39	1134712	. CLIP, ADJ SCREW	1	
- 40	1134948	. SPRING-EXTENSION 0.139 OD X 1/2 LG	4	
- 41	1159308	. STUD-LEVER	2	A
- 42	1159312	. FOLLOWER ASSEMBLY-CB5 CAM	1	
- 42A	1187168	. . RETAINER	1	
- 42B	1187416	. . WASHER,ABSORBENT	1	
- 42C	1128618	. . ROLLER,CAM FOLLOWER	1	
- 43	1138454	. LEVER ASSEMBLY, SB INTERLOCK	1	A
- 44	1138805	. KEEPER, SPACE BAR	1	A
- 47	1159244	. LEVER-LOCK OUT	1	
- 48	1159246	. GUIDE-KEYLEVER	1	
- 50	1187654	. PAWL	1	
- 56	1159306	. LEVER-BACK SPACE RESTORE	1	
- 57	1159307	. LEVER-CARRIER RETURN RESTORE	1	
- 59	1159942	. ARM ASM-FOLLOWER CR	1	
- 60	1159947	. STUD-BS FOLL ROLL	1	
- 61	1159949	. ARM-FOLL BS CONT	1	
- 63	1159952	. ROLLER-CAM FOLL	2	
- 67	116457E	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 72	1166770	. WICK-OIL	3	
- 73	1187001	. WICK-OIL	4	
- 74	1187002	. WICK-OIL	1	
- 75	1187003	. WICK-OIL	1	
- 76	1187163	. WICK-OIL	2	
- 78	1072703	. SPRING	1	
- 79	1128673	. INTERPOSER ASSEMBLY-CARRIER RETURN,EARLY STYLE	1	
- 79	1187516	. INTERPOSER,CARRIAGE RET, LATE STYLE	1	
- 80	1128674	. INTERPOSER ASSEMBLY-BACKSPACE,EARLY STYLE	1	
- 80	1187514	. INTERPOSER,BACKSPACE, LATE STYLE	1	
- 80A	1187514	. INTERPOSER,INDEX, LATE STYLE	1	
- 80A	1128674	. INTERPOSER ASSEMBLY-INDEX,EARLY STYLE	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
5 - 81	1128674	. INTERPOSER ASSEMBLY-TAB,EARLY STYLE	1	
- 81	1187515	. INTERPOSER,TAB, LATE STYLE	1	
- 81A	1135229	. INTERPOSER ASSEMBLY-SPACEBAR,EARLY STYLE	1	A
- 81A	1187517	. INTERPOSER,SPACE, LATE STYLE	1	A
- 82	322065	SCREW,MACH-BIND HD 6-32 X 5/8 LG	1	
- 83	187188	SCREW-OPER CAM FOLLOWER	1	
- 84	1135193	CLEVIS-LINK	2	
- 85	1127733	SCREW,MACH-SLTD HD 6-32 X 1/4 LG	2	
- 86	1159950	LINK-CONTACT ACT RH	1	
- 87	1159954	LINK-CONTACT ACT LH	1	
- 88	1164577	SCREW,MACH-BINDING HD 6-32 X 0.312 LG	2	
- 89	1159240	SPRING-TOGGLE	1	
- 90	1187181	. SPRING	3	
- 92	1187423	. PLATE,LOCK	1	

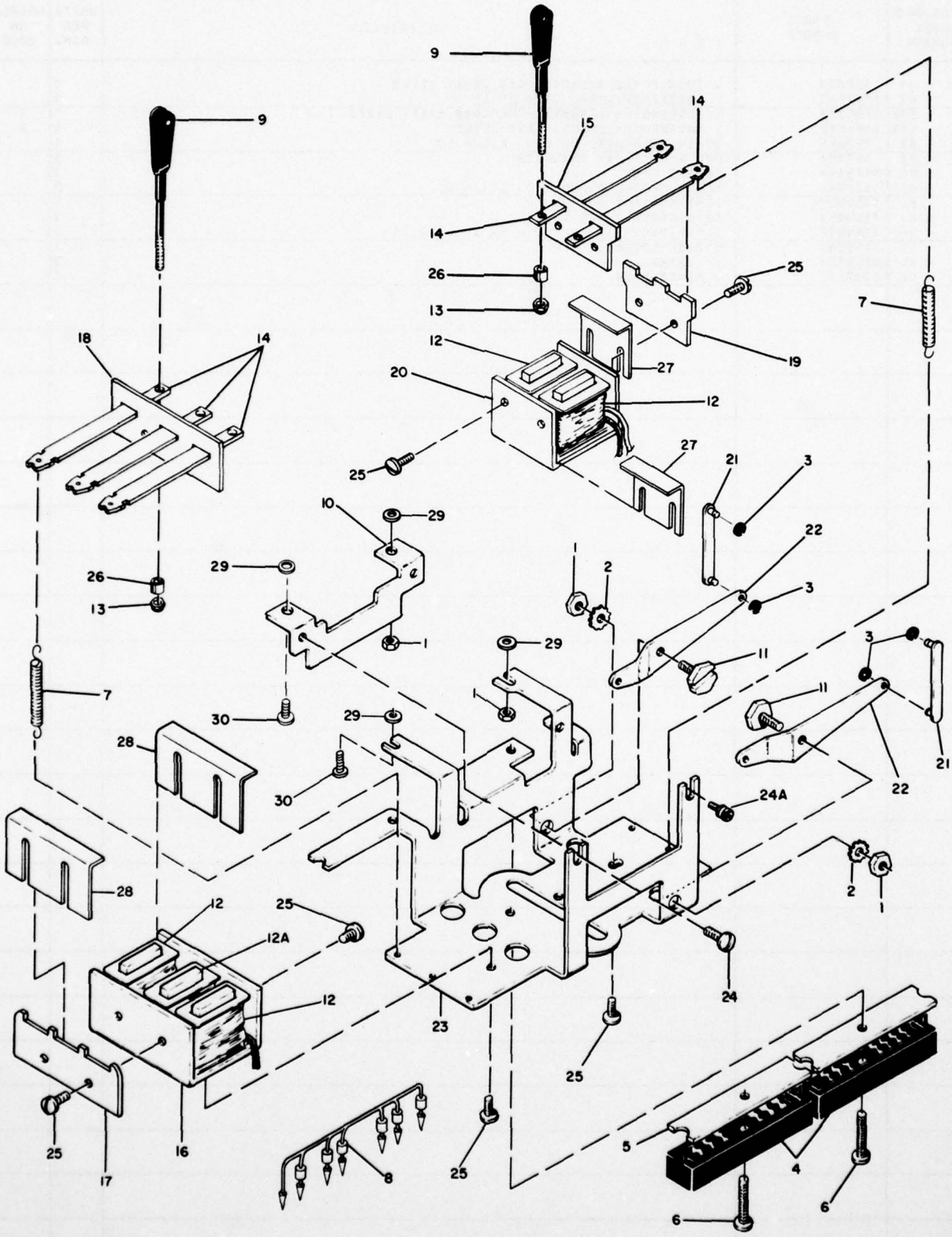


FIGURE 6. OPERATIONAL MAGNET ASSEMBLY. SEE LIST 6.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		OPERATIONAL MAGNET ASSEMBLY		
6 -	1203849	OPERATICNAL MAGNET ASM USED ON 1980	REF	
		SEE FIGURE 6 FOR ILLUSTRATION		
-	1203855	OPERATIONAL MAGNET ASM USED ON 2970	REF	
		SEE FIGURE 6 FOR ILLUSTRATION		
-	1203846	OPERATIONAL MAGNET ASM USED ON 1518	REF	
		SEE FIGURE 6 FOR ILLUSTRATION		
-	1203850	OPERATICNAL MAGNET ASM USED ON 2740 AND 2741	REF	
		SEE FIGURE 6 FOR ILLUSTRATION		
- 1	38051	. NUT-FRICTION LATCH MOUNTING	4	
- 2	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	2	
- 3	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	4	
- 4	1166025	. CONNECTOR,RECP,ELEC- 24 FEMALE CONTACTS	2	
- 5	302131	. STRIP-TERMINAL BLOCK INSULATOR	2	
- 6	438549	. SCREW,MACH-BIND HD 4-40 X 7/16 LG	2	
- 7	1100938	. SPRING,HELICAL,EXTENSION	AR	
- 8	1145414	. DIODE ASSEMBLY	1	
- 9	1135193	. LINK, SB INTERPOSER PULL	1	
- 10	1128686	. SUPPORT	1	
- 11	1128714	. SCREW	2	
- 12	1135134	. COIL ASSEMBLY, PRINT MAGNET-TAB,CR,INDEX	1	
- 12A	1128964	. COIL ASSEMBLY,B/S-2740,2741 AND 1980	1	
- 13	1159716	. NUT-OPERATIONAL PULL LINK ADJ	AR	
- 14	1166331	. ARMATURE	AR	
- 15	1166332	. BACKSTOP-OPERATICNAI ARM FRONT	1	
- 16	1159833	. BRACKET ASSEMBLY-OPERATIONAL MAG FRONT	1	
- 17	1166335	. PLATE-ARM PIVOT FRONT	1	
- 18	1166334	. BACKSTOP-OPERATIONAL ARM REAR	1	
- 19	1166333	. PLATE-ARM PIVOT REAR	1	
- 20	1159842	. BRACKET ASSEMBLY-OPERATIONAL MAG REAR	1	
- 21	1159945	. LINK ASM	2	
- 22	1159958	. ARM-CONTACT ACT	2	
- 23	1166336	. FRAME-OPERATICNAL MAGNET	1	
- 24	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 24A	1124234	. STUD-ECCENTRIC	1	
- 25	1164582	. SCREW	12	
- 26	1166304	. WASHER-SHOCK ABSORBER	AR	
- 27	1166337	. SHIM-OPERATIONAL MAGNET REAR	2	
- 28	1166338	. SHIM-OPERATIONAL MAGNET FRONT	2	
- 29	109084C	WASHER	4	
- 30	1164577	SCREW,MACH-BINDING HD 6-32 X 0.312 LG	2	

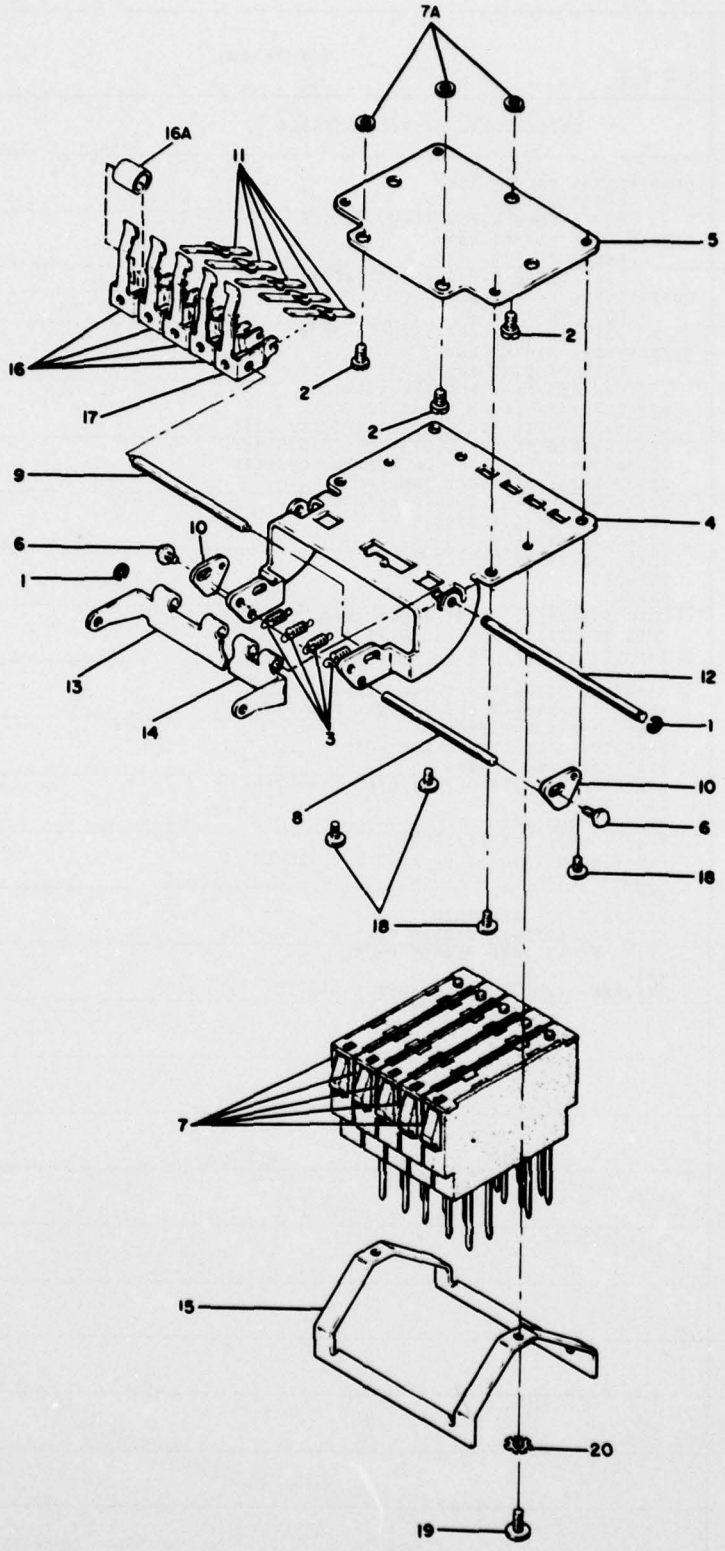


FIGURE 7. OPERATICNAL TRANSMITTING CONTACT ASSEMBLY. SEE LIST 7.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		OPERATIONAL TRANSMITTING CONTACT ASSEMBLY		
7 -	1203959	CONTACT ASM-OPERATIONAL TRANSMITTING,1980	REF	
-	1203964	CONTACT ASM-OPERATIONAL TRANSMITTING,2970	REF	
-	1203965	CONTACT ASM-OPERATIONAL TRANSMITTING,2740	REF	
-	1203952	CONTACT ASM-OPERATIONAL TRANSMITTING,1518	REF	
		SEE FIGURE 7 FOR ILLUSTRATION		
- 1	469565	. CLIP	2	
- 2	478394	. SCREW	3	
- 3	1090343	. SPRING,HELICAL,EXTENSION	AR	
- 4	1159961	. BRACKET-CONTACT	1	
- 5	1159959	. PLATE-ADAPTER	1	
- 6	1138353	. SCREW	2	
- 7	1159937	. CONTACT BLOCK ASM	AR	
		USED ON ALL MACHINES EXCEPT 2970		
- 7	1166606	. CONTACT BLOCK-FILLER BLANK	AR	
- 7	1277196	. CONTACT BLOCK- 2 POSITIONS	AR	
		USED ONLY ON MACHINES 2970		
- 7A	1159117	. SPACER	3	
- 8	1159938	. SHAFT-LATCH SPRING	1	
- 9	1159940	. SHAFT-FOLLOWER	1	
- 10	1159941	. PLATE-LATCH ADJ	2	
- 11	1159951	. CONTACT-LATCH	AR	
- 12	1159953	. SHAFT-ACTUATOR ARM	1	
- 13	1159956	. ACTUATOR-CONT LH	1	
- 14	1159957	. ACTUATOR-CONT RH	1	
- 15	1159963	. CLAMP-OPR CONTACT	1	
- 16	1159966	. FOLLOWER-INTERPOSER LH	AR	
- 16A	1077389	. SPACER-INTERPOSER FOLLOWER	AR	
- 17	1159967	. FOLLOWER-INTERPOSER RH	1	
- 18	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	4	
- 19	1164580	. SCREW	2	
- 20	338169	. WASHER,LOCK-EXT TEETH NO. 4 X .260 OD	2	

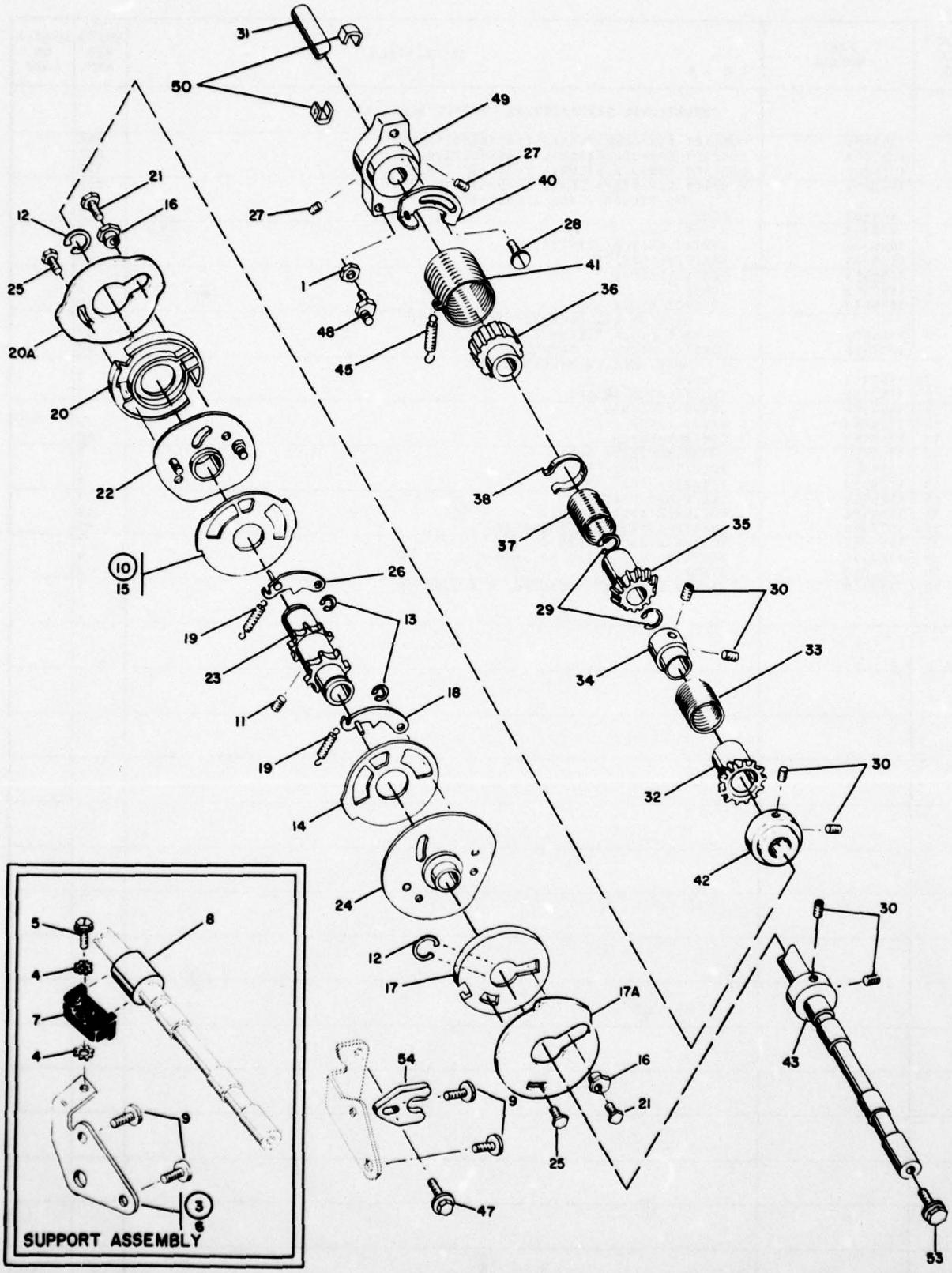


FIGURE 8. EARLY STYLE 2740/2741 OPERATIONAL SHAFT ASSEMBLY. SEE LIST 8.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		EARLY STYLE 2740/2741 OPERATIONAL SHAFT ASSEMBLY		
8 -	NO NO.	OPERATICNAL SHAFT ASM-EARLY 2740/2741 SEE FIGURE 8 FOR ILLUSTRATION	NP	
- 1	37913	. NUT-HEX 4-40 X .250 ID	1	
- 3	1272675	. OPERATE SHAFT	1	
- 4	56722	. . LOCKWASHER-EXT. TOOTH OD. .150XID. .320	2	
- 5	1128326	. . SCREW,ASM FL WASH-HEX HD 6-32 X 0.310 LG	1	
- 6	1135311	. . BRACKET-SUPPORT	1	
- 7	1159843	. . SUPPORT-CAM SHAFT BUSHING	1	
- 8	1159844	. . BUSHING-CAM SHAFT SUPPORT	1	
- 9	1164577	. . SCREW,MACH-BINDING HD 6-32 X 0.312 LG	2	
- 10	1272915	. CAM AND RATCHET ASM	1	
- 11	257969	. . SETSCREW-FLUTED SOC 6-32 X 1/8 CUP PT	1	
- 12	324221	. . RETAINER,OPERATIONAL CAM MTG	2	
- 13	1073418	. . RING-RETAINING	2	
- 14	1123566	. . WHEEL,INDEX CLUTCH	1	
- 15	1123570	. . WHEEL,BACKSPACE CLUTCH	1	
- 16	1159948	. . ECCENTRIC CHECK RING	2	
- 17	1123594	. . RING,INDEX CAM CHECK	1	
- 17A	1159964	. . CAM-CONT OPERATING	1	
- 18	1128413	. . PAWL, INDEX CLUTCH	1	
- 19	1132064	. . SPRING,HELICAL,EXTENSION	2	
- 20	1187502	. . CHECK RING-BS/SB	1	
- 20A	1159965	. . CAM-CONTACT OPERATE	1	
- 21	1159955	. . SCREW-ECC LOCKING	2	
- 22	1159267	. . CAM ASSEMBLY	1	
- 23	1159269	. . RATCHET-OPERATIONAL CLUTCH	1	
- 24	1159886	. . CAM ASSEMBLY-INDEX	1	
- 25	1123588	. . SCREW,MACH-HEX HD 4-40 X 0.260 LG	2	
- 26	1166217	. . PAWL ASSEMBLY-BACK SPACE	1	
- 27	257975	. SETSCREW-SPLINE DR CUP PT 6-32 X 3/8 LG	2	
- 28	265195	. SCREW,MACH-HEX HD 6-32 X 7/32 LG	1	
- 29	324497	. RETAINER,OPERATIONAL CAM SHAFT	2	
- 30	1100523	. SETSCREW-SPLINE DR CUP PT 6-32 X 3/16 LG	6	
- 31	1128161	. SHAFT-OPERATIONAL CAM	1	
- 32	1123571	. PINION,TAB GOVERNING	1	
- 33	1123572	. SPRING,TAB GOVERNING	1	
- 34	1123573	. HUB,TAB GOVERNING	1	
- 35	1123574	. PINION,CARRIAGE RETURN	1	
- 36	1123575	. BUSHING,CARRIAGE RETURN CLUTCH	1	
- 37	1123576	. SPRING,CARRIAGE RETURN CLUTCH	1	
- 38	1123577	. CLAMP,CARRIAGE RETURN CLUTCH	1	
- 40	1123580	. CLAMP,SHOCK UNLOAD SPRING	1	
- 41	1123581	. SPRING,SHOCK UNLOADER	1	
- 42	1159939	. COLLAR-TAB GOV PIN	1	
- 43	1123582	. COLLAR,TAB GOV PINION	1	
- 45	1124290	. SPRING, SHK UNLATCH EXT	1	
- 47	1128326	. SCREW,ASM FL WASH-HEX HD 6-32 X 0.310 LG	1	
- 48	1132069	. STUD, ECCENTRIC SHK UNL CLAMP	1	
- 49	1133548	. HUB, SHOCK UNLOAD	1	
- 50	1133583	. INSERT, SHOCK UNLOAD HUB	2	
- 53	1135233	. SCREW,SHLDR- 0.312 DIA 0.105 LG 6-32 THD	1	
- 54	1138116	. SUPPORT-CAM SHAFT	1	

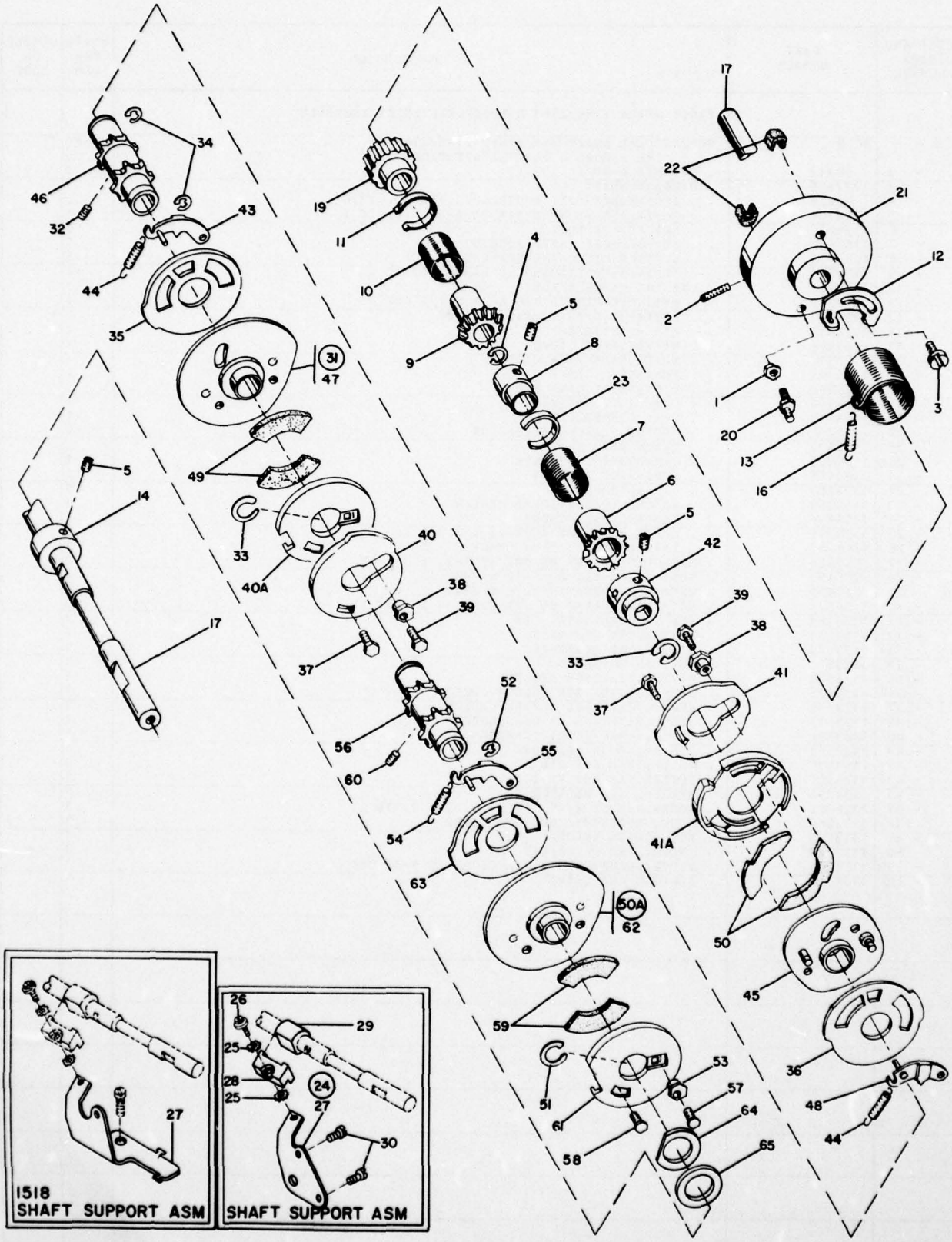


FIGURE 9. IMPROVED LUBE OPERATIONAL SHAFT ASSEMBLY. SEE LIST 9.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		IMPROVED LUBE OPERATIONAL SHAFT ASSEMBLY		
9 -	5992841	OPERATICNAL SHAFT ASM,IMPROVED LUBE,1980 AND 2740-2 DOC. INSERT	REF	B
-	5992847	OPERATICNAL SHAFT ASM,IMPROVED LUBE,ALL EXCEPT 1980 AND 2740-2 DOC. INSERT	REF	A
		SEE FIGURE 9 FOR ILLUSTRATION		
- 1	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL N	1	
- 2	1187222	. SETSCREW-6 FLUTE DR 6-32 X 5/8 LG CUP PT	2	
- 3	1174181	. SCREW,MACH-HEX HD 6-32 X 7/32 LG	1	
- 4	324497	. RETAINER,OPERATIONAI CAM SHAFT	2	
- 5	1175107	. SETSCREW	3	
- 6	1123571	. PINICN,TAB GOVERNING	1	
- 7	1123572	. SPRING,TAB GOVERNING	1	
- 8	1123573	. HUB,TAB GOVERNING	1	
- 9	1123574	. PINICN,CARRIAGE RETURN	1	
- 10	1175243	. SPRING,CARRIAGE RETURN CLUTCH	1	
- 11	1123577	. CLAMP,CARRIAGE RETURN CLUTCH	1	
- 12	1123580	. CLAMP,SHOCK UNLOAD SPRING	1	
- 13	1123581	. SPRING,SHOCK UNLOADER	1	
- 14	1123582	. COLLAR,TAB GOV PINICN	2	A
- 16	1141650	. SPRING-LOW VELOCITY FCL	1	
- 17	1166366	. SHAFT-OPERATIONAI CAM	1	
- 19	1159654	. ARBOR-TORQUE LIMIT	1	
- 20	1159674	. STUD,ECCENTRIC	1	
- 21	1166230	. HUB-SHOCK UNLOADER	1	
- 22	1166231	. INSERT-SHOCK UNLOADER HUB	2	
- 23	1166555	. CLAMP-TAB SPRING	1	
- 24	1272675	. OPERATE SHAFT	1	
- 25	56722	. . LOCKWASHER-EXT. TOOTH OD. .150XID. .320	2	
- 26	1128326	. . SCREW,ASM FL WASH-HEX HD 6-32 X 0.310 LG	1	A
- 26	1145543	. . SCREW ASSEMBLY-HEX HD 6-32 X 7/16 LG	1	B
- 27	1135311	. . BRACKET-SUPPORT	1	A
- 28	1159843	. . SUPPORT-CAM SHAFT BUSHING	1	
- 29	1159844	. . BUSHING-CAM SHAFT SUPPORT	1	
- 30	1164577	. . SCREW,MACH-BINDING HD 6-32 X 0.312 LG	2	A
- 31	1272915	. CAM AND RATCHET ASM	1	
- 32	1175103	. . SETSCREW-6 FLUTE DR 6-32 X 1/8 CUP PT	1	
- 33	324221	. . RETAINER,OPERATICNAI CAM MTG	2	
- 34	1073418	. . RING-RETAINING	2	
- 35	1187652	. WHEEL,INDEX CLUTCH-LATE STYLE NOT INTERCHANGEABLE WITH EARLY STYLE	1	
- 36	1187651	. WHEEL, BACKSPACE CLUTCH, LATE STYLE NOT INTERCHANGEABLE WITH EARLY STYLE	1	
- 37	1166372	. . SCREW,MACH-HEX HD 4-40 X 0.260 LG	2	
- 38	1159948	. . ECCENTRIC CHECK RING	2	
- 39	1159955	. . SCREW-ECC LCCKING	2	
- 40	1159964	. . CAM-CONT OPERATING	1	
- 40A	1203717	. . RING-INDEX AND C/R CAMCHECK	1	
- 41	1159965	. . CAM-CONTACT OPERATE	1	
- 41A	1187502	. . RING-BACKSPACE CAM CHECK EARLY STYLE-NOT INTERCHANGEABLE WITH LATE STYLE	1	
- 42	1159939	. . CCLIAR-TAB GOV PIN	1	
- 43	1187643	. . PAWL, INDEX CLUTCH LATE STYLE NOT INTERCHANGEABLE WITH EARLY STYLE	1	
- 44	123491	. . SPRING	2	
- 45	1187648	. CAM ASM	1	
- 46	1187644	. RATCHET,OPERATICNAL CLUTCH	1	
- 47	1187650	. CAM,CR/INDEX	1	
- 48	1166217	. . PAWL ASSEMBLY-BACK SPACE EARLY STYLE-NOT INTERCHANGEABLE WITH LATE STYLE	1	
- 48	1187642	. PAWL ASM. BACK SPACE, LATE STYLE	1	
- 49	1166559	. . WICK-OIL LONG	2	
- 50	1187503	. . WICK-BACKSPACE HUB OIL	2	
- 50A	1272962	. CAM ASM-REVERSE INDEX,1518 NCTE: ON 1980 AND 2740-2 THIS IS FEED ROLL LOWERING CAM	1	
- 51	324221	. . RETAINER,OPERATICNAL CAM MTG 1518 & 1980	1	
- 52	1174485	. . RING-RETAINING 1518 & 1980	1	
- 53	1123593	. . ECCENTRIC,CHECK RING ADJUST 1518 & 1980	1	
- 54	123491	. . SPRING,HELICAL TENSION, LATE STYLE	1	B
- 55	1143993	. . PAWL-FR CAM CLUTCH,1980	1	B
- 56	1159269	. . RATCHET-OPERATIONAL CLUTCH EARLY STYLE- NCT INTERCHANGEABLE WITH LATE STYLE	1	B
- 56	1164991	. . RATCHET-OPERATIONAL CLUTCH	1	B
- 57	1166372	. . SCREW,SELF LOCKING-HEX HD 4-40 X 0.260LG	1	
- 58	1166373	. . SCREW,SELF LOCKING-HEX HD 4-40 X 0.192LG	1	B

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
9 - 59	1166559	. . WICK-OIL LONG	2	B
- 60	1175103	. . SETSCREW-6 FLUTE DR 6-32 X 1/8 CUP PT	1	B
- 61	1187387	. . RING-FR CAM CHECK	1	B
- 62	1187388	. . CAM-FEED ROLL	1	B
- 63	1187390	. . WHEEL-FR CAM CLUTCH	1	B
- 64	1187391	. WASHER-END PLAY	1	B
- 65	324595	. WASHER-END PLAY	1	B

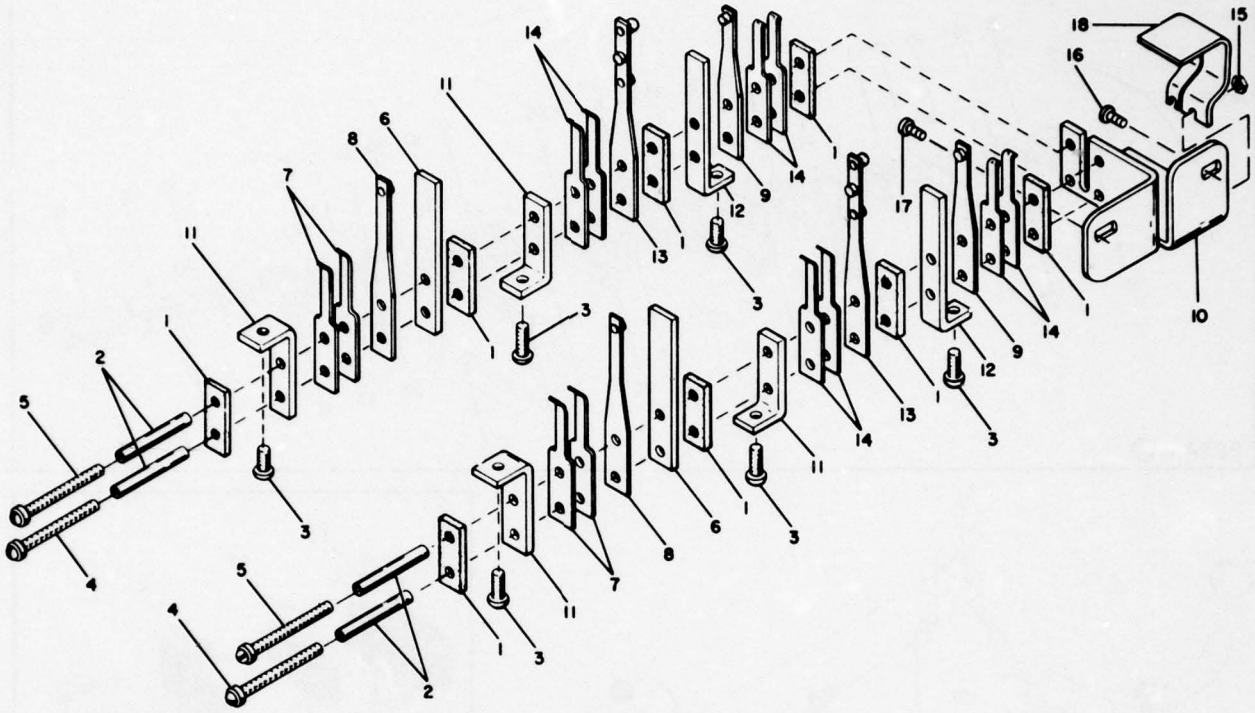


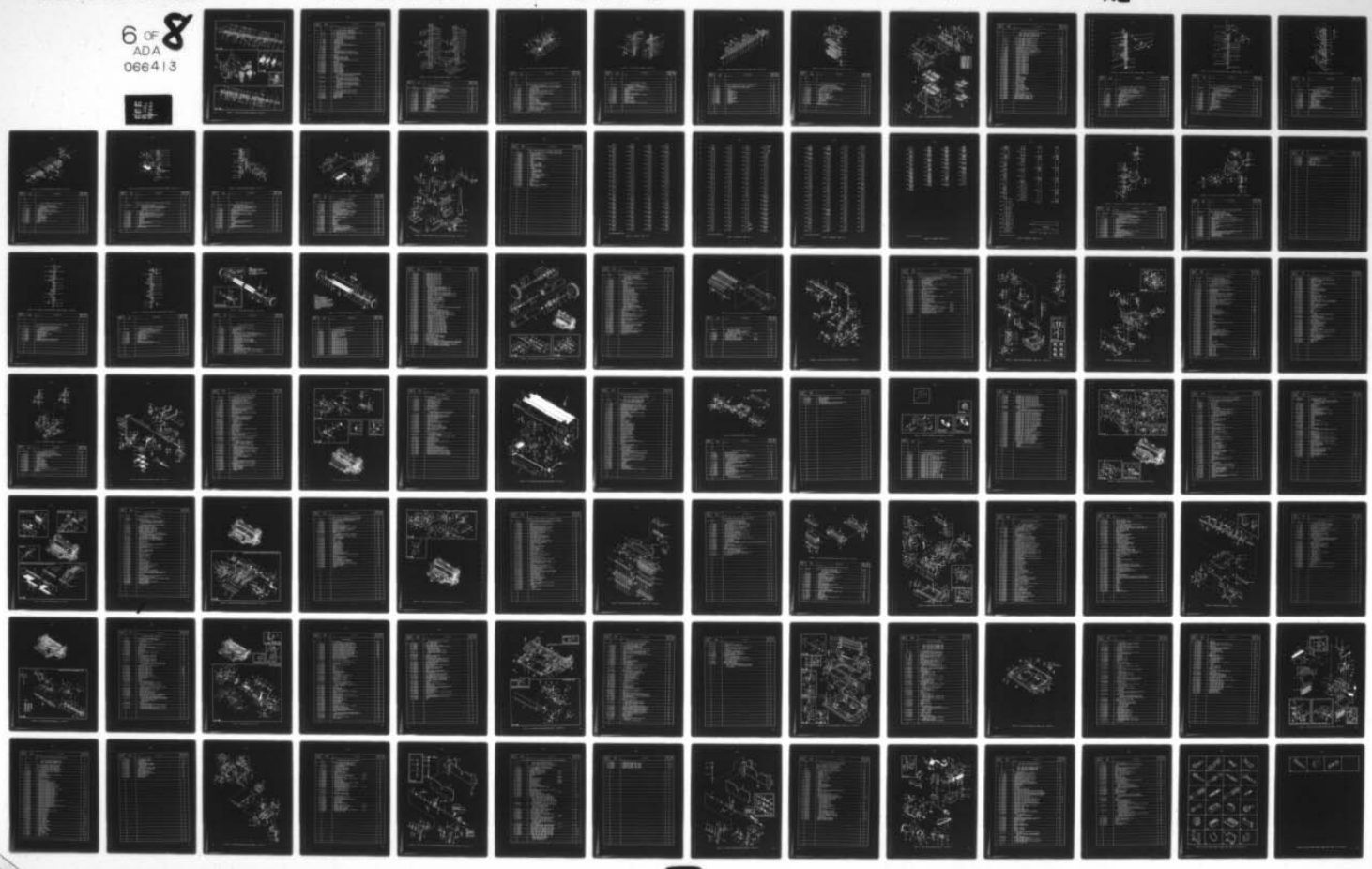
FIGURE 10. C1 AND C2 PRINT FEEDBACK AND LEVER CONTACT ASSEMBLY. SEE LIST 10.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		C1 AND C2 PRINT FEEDBACK AND LEVER CONTACT ASSEMBLY		
10 -	1128830	PRINT FEEDBACK AND LEVER CONTACT ASM SEE FIGURE 10 FOR ILLUSTRATION	REF	
- 1	37435	. INSULATOR,PLATE	8	
- 2	105052	. INSULATOR-SCR 0.128 ID 0.186 OD 17/32 LG	4	
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	6	
- 4	173205	. SCREW,ASMD WASHER-RH 5-40 X 21/32 LG	2	
- 5	173207	. SCREW,ASMD WASHER-RH 5-40 X 25/32 LG	2	
- 6	326119	. SUPPORT	2	
- 7	1135467	. BACKUP-CONTACT	4	
- 8	1128745	. CONTACT-SHIFT N/O	2	
- 9	1128746	. STRAP ASSEMBLY	2	
- 10	1128831	. BRACKET-CONTACT	1	
- 11	1128832	. TERMINAL-CONTACT	4	
- 12	1128833	. TERMINAL-CONTACT	2	
- 13	1128834	. STRAP ASSEMBLY-OPERATING	2	
- 14	1135466	. BACKUP-CONTACT	8	
- 15	7341	NUT,PLAIN,HEX- 5-40 X 1/4 FL N	2	
- 16	438549	SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
- 17	116458C	SCREW,MACH-BINDING HD 4-40 X 0.250 LG	1	
- 18	1135512	COVER,DUST-CONTACT	1	

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

6 OF 8
ADA
066413



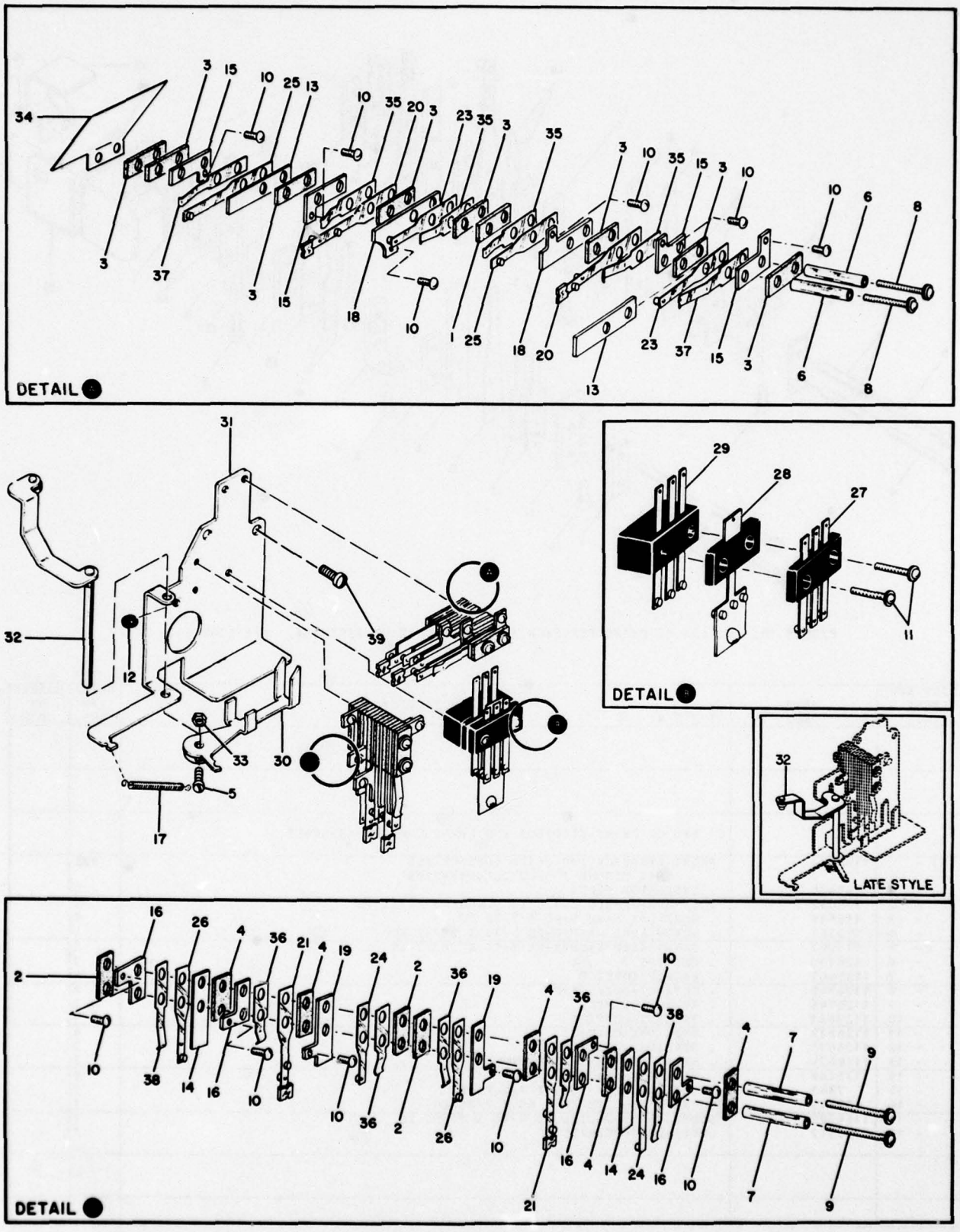


FIGURE 11. C3 AND C4 SHIFT CONTACT ASSEMBLIES. SEE LIST 11.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		C3 AND C4 SHIFT CONTACT ASSEMBLIES		
11 -		C3 AND C4 SHIFT CONTACT ASSEMBLIES SEE FIGURE 11 FOR ILLUSTRATION	REF	
-	1128939	SHIFT CONTACT ASSEMBLY- 2740 & 2741 EARLY STYLE	REF	
-	1187212	SEE FIGURE 11 FOR ILLUSTRATION SHIFT CONTACT ASSEMBLY LATE STYLE 2970,2740 & 2741	REF	
-	1187578	SEE FIGURE 11 FOR ILLUSTRATION SHIFT CONTACT ASM-1518 ONLY SEE FIGURE 11 FOR ILLUSTRATION	REF	
- 1	27460	. INSULATOR-PLATE	1	
- 2	27460	. INSULATOR-PLATE	3	
- 3	37435	. INSULATOR,PLATE	8	
- 4	37435	. INSULATOR,PLATE	5	
- 5	38354	. SCREW,MACH-FIL H 6-32 X 1/2 LG USED ON MACHINES ABOVE SN 4619427	1	
- 6	104278	. INSULATION	2	
- 7	104278	. INSULATION	2	
- 8	104676	. SCREW,MACH	2	
- 9	104285	. SCREW	2	
- 10	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	12	
- 11	173207	. SCREW,ASMD WASHER-RH 5-40 X 25/32 LG	2	
- 12	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK USED ON EARLY STYLE BELOW SN 4619427	1	
- 13	326119	. SUPPORT	2	
- 14	326119	. SUPPORT	2	
- 15	339109	. TERMINAL-CONTACT SPRING	4	
- 16	339109	. TERMINAL-CONTACT SPRING	4	
- 17	1090162	. SPRING,HELICAL,EXTENSION USED ON EARLY STYLE BELOW SN 4619427	1	
- 18	1128743	. TERMINAL	2	
- 19	1128743	. TERMINAL	2	
- 20	1128744	. STRAP ASSEMBLY	2	
- 21	1128744	. STRAP ASSEMBLY	2	
- 23	1128745	. CONTACT-SHIFT N/O	4	
- 24	1128745	. CONTACT-SHIFT N/O	2	
- 25	1128746	. STRAP ASSEMBLY	4	
- 26	1128746	. STRAP ASSEMBLY	2	
- 27	1128946	. CONTACT ASSEMBLY	1	
- 28	1127948	. CONTACT ASSEMBLY	1	
- 29	1127947	. CONTACT ASSEMBLY	1	
- 30	1128950	. LEVER ASSEMBLY ON MACHINES BELOW SN 4619427 REPLACEMENT	1	
		OF THIS PART WILL REQUIRE PARTS 38354 AND 1134829 (INDICES 5 AND 33)		
- 31	1128952	. BRACKET	1	
		REPLACEMENT OF 1128952 WILL REQUIRE REPLACEMENT OF THE EARLY STYLE PARTS 1128950 AND 1128954 (INDICES 30 AND 32)		
- 32	1128954	. ARM-FOLLOWER USED ON EARLY STYLE BELOW SN 4619427 REPLACEMENT OF 1128954 WILL REQUIRE	1	
		REPLACEMENT OF THE EARLY STYLE PARTS 1128950 AND 1128952 (INDICES 30 AND 31)		
- 32	1187207	. ARM-FOLLOWER	1	
		USED ON MACHINES ABOVE SN 4643262		
- 33	1134829	. NUT	1	
- 34	1135425	USED ON MACHINES ABOVE SN 4619427 . SHIELD, CONTACT USED ON MACHINES BELOW SN 4619427	1	
- 35	1135466	. BACKUP-CONTACT	8	
- 36	1135466	. BACKUP-CONTACT	4	
- 37	1135467	. BACKUP-CONTACT	4	
- 38	1135467	. BACKUP-CONTACT	2	
- 39	1164576	. SCREW	3	

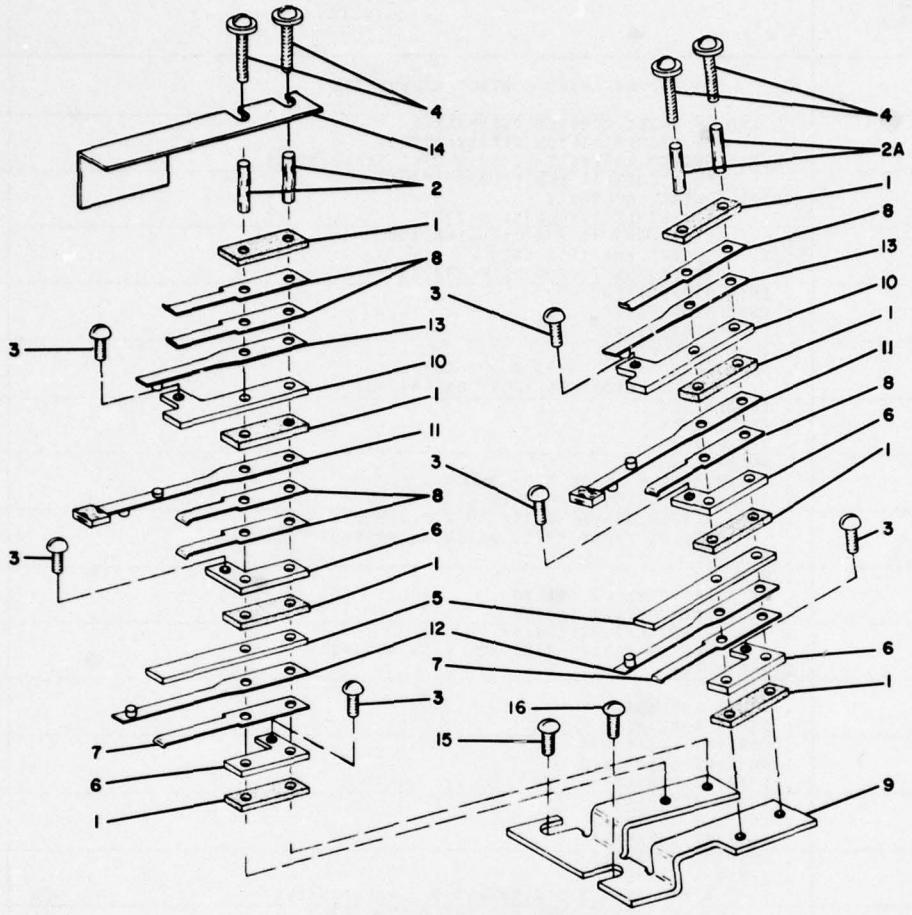


FIGURE 12. C5 AND C6 FEEDBACK CONTACT ASSEMBLIES. SEE LIST 12.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		C5 AND C6 FEEDBACK CONTACT ASSEMBLIES		
12 -	1135308	CONTACT ASSEMBLY-C5	REF	A
-	1135306	SEE FIGURE 12 FOR ILLUSTRATION OPERATIONAL FEED BACK CONTACT ASSEMBLY-C6 SEE FIGURE 12 FOR ILLUSTRATION	REF	B
- 1	37435	. INSULATOR,PLATE	8	
- 2	105052	. INSULATOR-SCREW NO. 5 X 1/2 LG	2	A
- 2A	100229	. INSULATOR	2	B
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	6	
- 4	173205	. SCREW,ASMD WASHER-RH 5-40 X 21/32 LG	4	
- 5	326119	. SUPPORT	2	
- 6	339109	. TERMINAL-CONTACT SPRING	4	
- 7	1145588	. BACKUP-CONTACT	2	
- 8	113546E	. BACKUP-CONTACT	6	
- 9	1135309	. BRACKET	1	A
- 9	1135307	. BRACKET- C6	1	B
- 10	1128743	. TERMINAL	2	
- 11	1128744	. STRAP ASSEMBLY	2	
- 12	1128745	. CONTACT-SHIFT W/O	2	
- 13	1128746	. STRAP ASSEMBLY	2	
- 14	1159536	. SHIELD	1	
- 15	1164576	SCREW	1	
- 16	1166041	SCREW-CONTACT MTG	1	

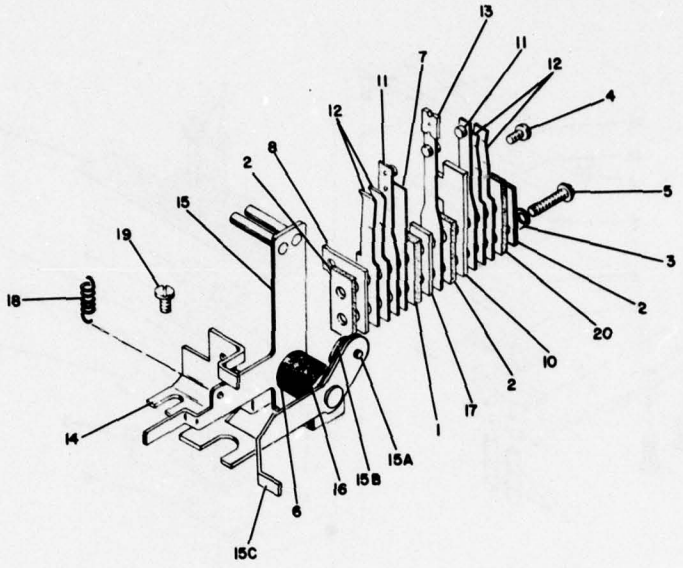


FIGURE 13. 1980 AND 2740-2 C5 AND C6 FEEDBACK CONTACT ASSEMBLY. SEE LIST 13.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		1980 AND 2740-2 C5 AND C6 FEEDBACK CONTACT ASSEMBLY		
13 -	1166152	CONTACT ASSEMBLY- C5 AND C6 USED ONLY ON MACHINES 1980 SEE LIST 30 FOR ALL OTHER MACHINES SEE FIGURE 13 FOR ILLUSTRATION	REF	
- 1	27460	. INSULATOR-PLATE	1	
- 2	37435	. INSULATOR,PLATE	3	
- 3	105052	. INSULATOR-SCR 0.128 ID 0.186 OD 17/32 LG	2	
- 4	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	3	
- 5	173206	. SCREW,ASMD WASHER-RH 5-40 X 0.719 LG	2	
- 6	257982	. CLIP,RETAINING-E TYPE 0.188 DIA GROOVE	1	
- 7	326119	. SUPPORT	1	
- 8	339109	. TERMINAL-CONTACT SPRING	1	
- 10	1128743	. TERMINAL	1	
- 11	1128745	. CONTACT-SHIFT N/O	2	
- 12	1135467	. BACKUP-CONTACT	4	
- 13	1135629	. CONTACT ASSEMBLY	1	
- 14	1166153	. BRACKET ASSEMBLY	1	
- 15	1166154	. BELLCRANK ASSEMBLY	1	
- 15A	1142214	. SCREW- LATE STYLE MACHINES ONLY	1	
- 15B	1123593	. ECCENTRIC- LATE STYLE MACHINES ONLY	1	
- 15C	1187699	. LEVER- LATE STYLE MACHINES ONLY	1	
- 16	1166188	. WICK-OIL	2	
- 17	1187521	. TERMINAL-CONTACT SPRING	1	
- 18	58853	. SPRING,HELICAL,EXTENSION	1	
- 19	1117759	SCREW,MACH-BINDING HD 6-32 X 0.188 LG	1	
- 20	1202646	SPACER-C5/C6 CONTACT	1	

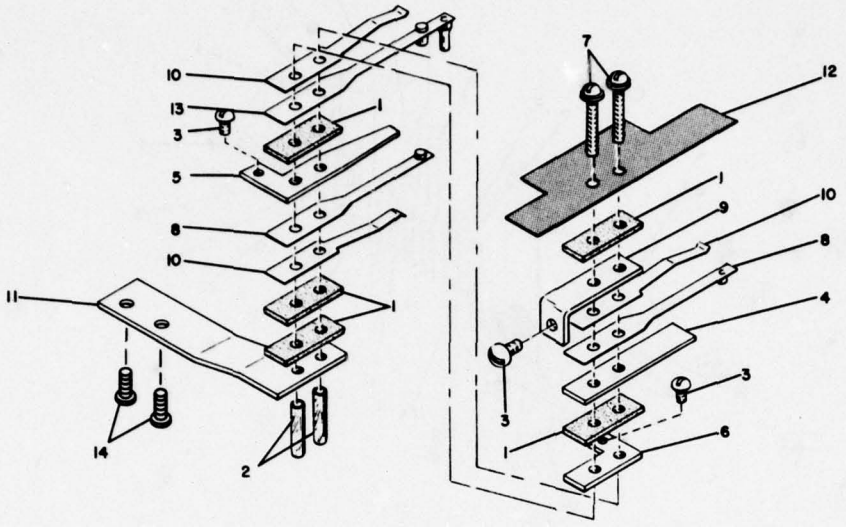


FIGURE 14. C7 SHIFT CONTACT ASSEMBLY. SEE LIST 14.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		C7 SHIFT CONTACT ASSEMBLY		
14 -	1176843	CONTACT ASSEMBLY-C7 SHIFT USED ON ALL MACHINES BUT 1518 SEE FIGURE 14 FOR ILLUSTRATION	REF	
- 1	37435	. INSULATOR,PLATE	5	
- 2	100134	. INSULATOR-SCR 0.128 ID 0.186 OD 9/16 LG	2	
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	3	
- 4	326119	. SUPPORT	1	
- 5	339107	. TERMINAL	1	
- 6	339109	. TERMINAL-CONTACT SPRING	1	
- 7	173215	. SCREW,ASMD WASHER-RH 5-40 X 0.688 LG	2	
- 8	1128745	. CONTACT	2	
- 9	1128832	. TERMINAL-CONTACT	1	
- 10	1135467	. BACKUP-CONTACT	3	
- 11	1135621	. BRACKET-CONTACT	1	
- 12	1159112	. SHIELD	1	
- 12	5152734	. SHIELD-WTC ONLY	1	
- 13	1176844	. CONTACT-OPER STRAP	1	
- 14	1164580	SCREW,MACH-BINDING HD 4-40 X 0.250 LG	2	

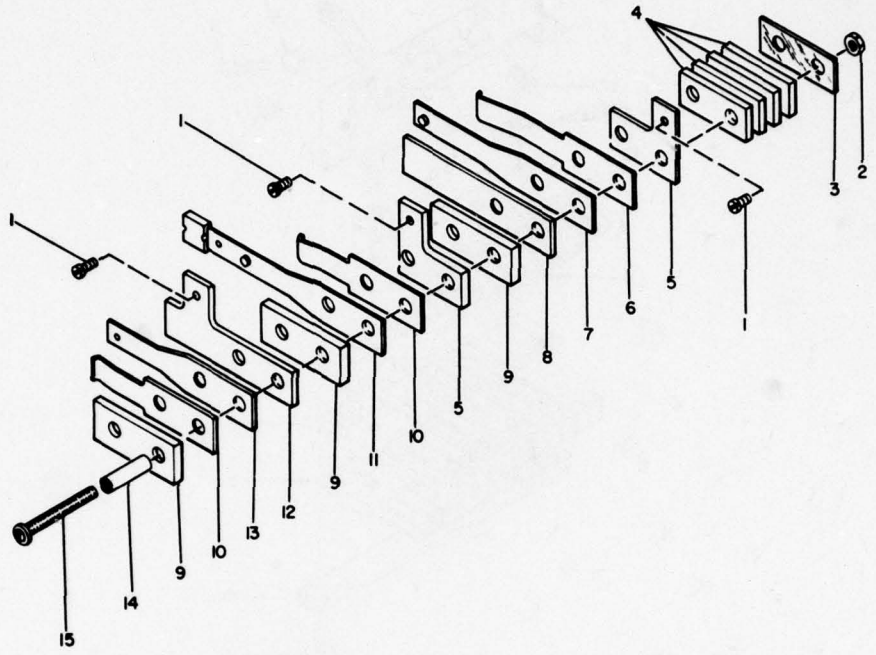


FIGURE 15. CONTACT ASSEMBLY-SHIFT MODE #1 AND REVERSE INDEX. SEE LIST 15.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		CONTACT ASSEMBLY-SHIFT MODE #1 AND REVERSE INDEX		
15 -	1203612	CONTACT ASSEMBLY-SHIFT MODE #1 - 1518 ONLY SEE FIGURE 15 FOR ILLUSTRATION	REF	
- 1	118418	. SCREW	3	
- 2	27073	. NUT	2	
- 3	1135289	. INSULATOR	1	
- 4	27460	. INSULATOR-PLATE	4	
- 5	339109	. TERMINAL	2	
- 6	1135467	. BACKUP-CONTACT	1	
- 7	1128745	. CONTACT N/O	1	
- 8	326119	. SUPPORT	1	
- 9	37435	. INSULATOR-PLATE	3	
- 10	1135466	. BACKUP-CONTACT	2	
- 11	1128744	. CONTACT O/S	1	
- 12	1128743	. TERMINAL	1	
- 13	1128746	. CONTACT N/O	1	
- 14	100349	. INSULATOR-SCREW	2	
- 15	173210	. SCREW	2	

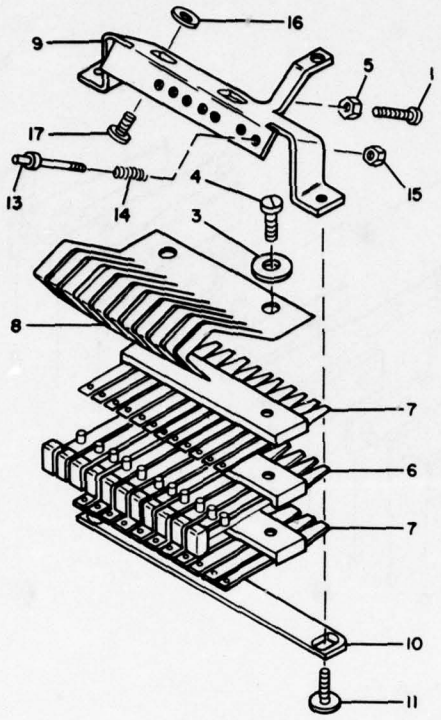
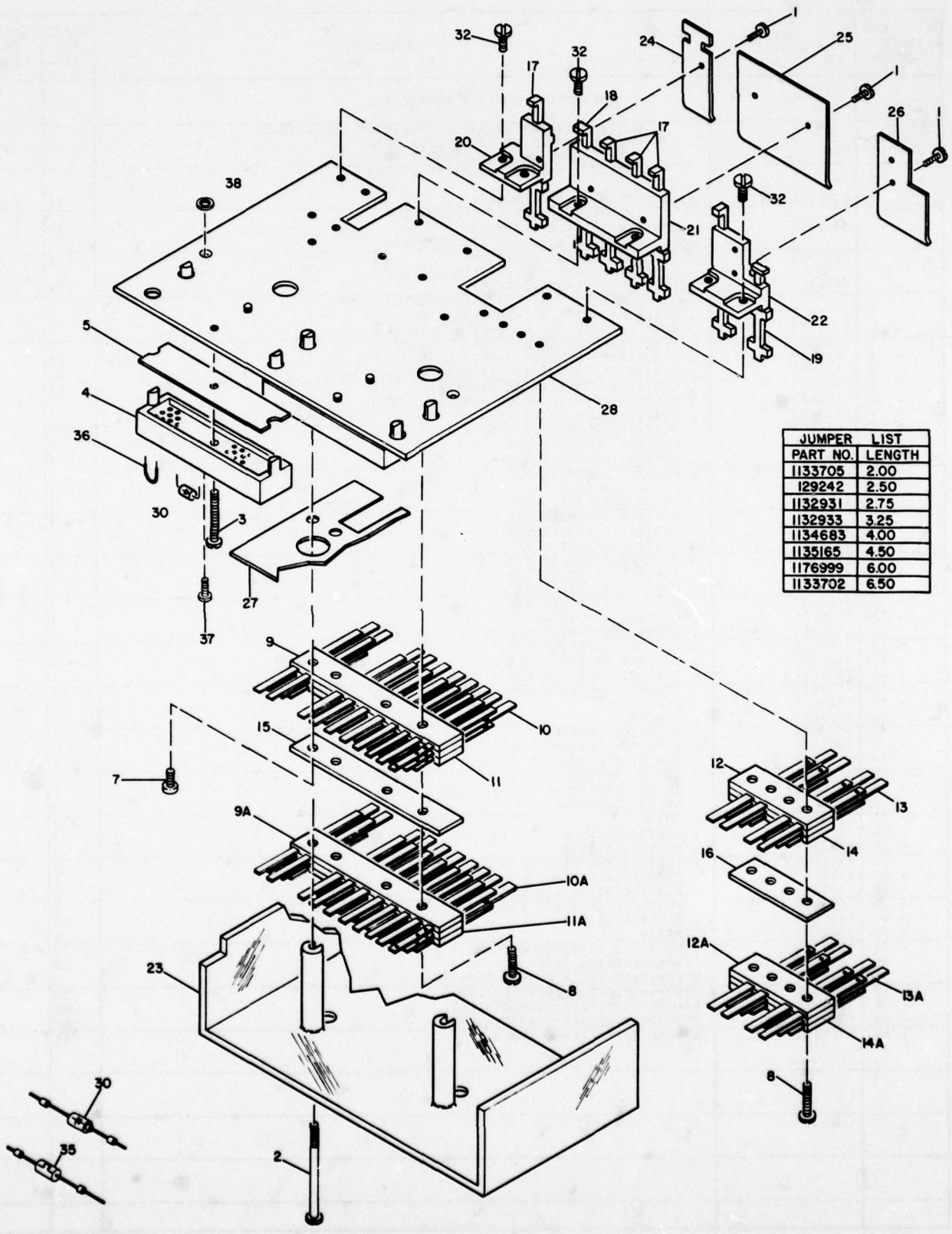


FIGURE 16. 2970 KEYBOARD KEYLEVER CONTACT ASSEMBLY. SEE LIST 16.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		2970 KEYBOARD KEYLEVER CONTACT ASSEMBLY		
16 -	1135258	CONTACT ASM-KEYBOARD KEYLEVER USED ONLY ON MACHINES 2970 SEE FIGURE 16 FOR ILLUSTRATION	REF	
- 1	438546	. SCREW,MACH-FIL H 4-40 X 7/8 LG-LOCKOUT	2	
- 3	1090630	. WASHER,FL-NO. 3 X 5/16 OD X 1/64 THK	2	
- 4	1090933	. SCREW-CONTACT MOUNTING	2	
- 5	1127763	. NUT	2	
- 5	216128	. NUT-BS KEYLEVER STUD	1	
- 6	1135175	. MOLDING, CONTACT	1	
- 7	1135177	. MOLDING, CONTACT	2	
- 8	1135178	. SPRING, CONTACT ACTUATING	1	
- 9	1135179	. BRACKET, CONTACT MTG.	1	
- 10	1135180	. BRACKET, CONTACT MTG.	1	
- 11	1127745	. SCREW,MACH-FLAT FIL H 4-40 X 0.250 LG	2	
- 13	1159218	. STUD-REPEAT	1	
- 14	100027	. SPRING-REPEAT	1	
- 15	1127763	. NUT	1	
- 16	1074145	WASHER,FLAT-NO. 6	2	
- 17	1164577	SCREW,MACH-BINDING HD 6-32 X 0.312 LG	2	



JUMPER PART NO.	LIST LENGTH
1133705	2.00
129242	2.50
1132931	2.75
1132933	3.25
1134683	4.00
1135165	4.50
1176999	6.00
1133702	6.50

FIGURE 17. SELECTION CONTACT ASSEMBLIES. SEE LIST 17.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		SELECTION CONTACT ASSEMBLIES		
17 -		CODE A USED ON MACHINES 2740,2741 AND 2740-2 CODE B USED ONLY ON MACHINE 1518 CODE C USED ONLY ON MACHINE 2970 CODE D USED ONLY ON MACHINE 1980		
-	5173716	SELECTION CONTACT ASSEMBLY	REF	A
-	1187615	SEE FIGURE 17 FOR ILLUSTRATION SELECTION CONTACT ASSEMBLY SEE FIGURE 17 FOR ILLUSTRATION	REF	B
-	1277105	SELECTION CONTACT ASSEMBLY SEE FIGURE 17 FOR ILLUSTRATION	REF	C
-	1176932	SELECTION CONTACT ASSEMBLY SEE FIGURE 17 FOR ILLUSTRATION	REF	D
- 1	1856	. SCREW,MACH-FIL H 2-56 X 3/16 LG	5	C
- 1	1177112	. SCREW,MACH-TRUSS HD 2-56 X 3/16 LG	5	
- 2	45183	. SCREW,MACH RD HD NO. 4-40 X 1-3/8 LG	2	
- 3	438549	. SCREW,MACH-BIND HD 4-40 X 0.375 LG	AR	
- 4	302090	. CONNECTOR,RECP,ELEC- 24 FEMALE CONTACTS	AR	
- 5	302131	. STRIP-TERMINAL BLOCK INSULATOR	AR	
- 7	1164583	. SCREW,MACH-BINDING HD 4-40 X 0.625 LG	8	D
- 7	1132887	. SCREW-USE ON CODES A&B	6	
- 8	438554	. SCREW,MACH-BIND HD 4-40 X 1 LG	8	C
- 9	1128795	. CONTACT ASSEMBLY-N/C	1	C
- 9	1159880	. CONTACT ASSEMBLY-N/C	1	
- 9	1187034	. CONTACT ASSEMBLY-N/C	1	B
- 9A	1128795	. CONTACT ASSEMBLY-N/C	1	C
- 10	1128798	. CONTACT ASSEMBLY-O/P	1	C
- 10	1187035	. CONTACT ASSEMBLY-O/P	1	
- 10A	1128798	. CONTACT ASSEMBLY	1	C
- 11	1128803	. CONTACT ASSEMBLY-N/O	1	C
- 11	1187036	. CONTACT ASSEMBLY-N/O	1	
- 11A	1128803	. CONTACT ASSEMBLY-N/O	1	C
- 12	1128806	. CONTACT ASSEMBLY-N/C	1	C
- 12	1187037	. CONTACT ASSEMBLY-N/C	1	
- 12A	1128806	. CONTACT ASSEMBLY-N/C	1	C
- 13	1128809	. CONTACT ASSEMBLY-O/P	1	
- 13	1187038	. CONTACT ASSEMBLY-O/P	1	B
- 13A	1128809	. CONTACT ASSEMBLY-O/P	1	C
- 14	1128812	. CONTACT ASSEMBLY-N/O	1	
- 14A	1128812	. CONTACT ASSEMBLY-N/O	1	C
- 15	1128815	. SPACER	1	C
- 16	1128816	. SPACER	1	C
- 17	1128817	. ACTUATOR-CONTACT	5	
- 18	1128818	. ACTUATOR-CONTACT	1	
- 19	1128819	. ACTUATOR-CONTACT	1	
- 20	1128820	. GUIDE-CONTACT	1	
- 21	1128821	. GUIDE-CONTACT	1	
- 22	1128822	. GUIDE-CONTACT	1	
- 23	1128823	. COVER	1	
- 24	1128824	. PLATE-ACTUATOR	1	
- 25	1128825	. PLATE-ACTUATOR	1	
- 26	1128826	. PLATE-ACTUATOR	1	
- 27	1128827	. INSULATOR-CONTACT	1	
- 28	1128829	. PLATE-CONTACT ASM MTG	1	B
- 28	1135485	. PLATE-CONTACT ASM MTG	1	
- 30	1135573	. DIODE ASSEMBLY	AR	
- 32	1164582	. SCREW	6	
- 35	1277195	. RESISTOR ASSEMBLY-68 OHMS	2	C
- 36	205329	. JUMPER-BRASS,3/16	AR	
- 37	38353	SCREW,MACH-FIL H 6-32 X 7/16 LG	2	
- 38	1090394	SPACER-SELECTION CONTACT-.010	AR	
- 38	1090622	SPACER-SELECTION CONTACT-.040	AR	
- 38	1090970	SPACER-SELECTION CONTACT-.020	AR	
- 38	1124461	SPACER-SELECTION CONTACT-.031	AR	

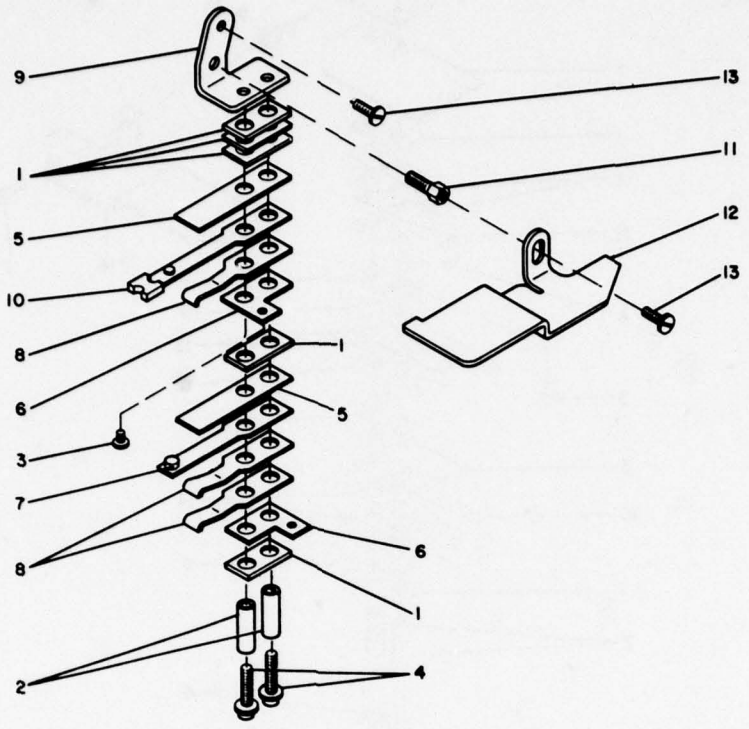


FIGURE 18. CARRIER RETURN INTERLOCK CONTACT ASSEMBLY. SEE LIST 18.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		CARRIER RETURN INTERLOCK CONTACT ASSEMBLY		
18 -	1176948	CONTACT ASSEMBLY-CARRIER RETURN USED ON ALL MACH. EXCEPT 1518 AND 2970 SEE LIST 19 FOR 1518 AND 2970 SEE FIGURE 18 FOR ILLUSTRATION	REF	
- 1	37435	. INSULATOR,PLATE	5	
- 2	105052	. INSULATOR-SCR 0.128 ID 0.186 OD 17/32 LG	2	
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	2	
- 4	173205	. SCREW,ASMD WASHER-RH 5-40 X 21/32 LG	2	
- 5	326119	. SUPPORT	2	
- 6	339109	. TERMINAL-CONTACT SPRING	2	
- 7	1128745	. CONTACT-SHIFT W/O	1	
- 8	1135467	. BACKUP-CONTACT	3	
- 9	1159558	. BRACKET	1	
- 10	1176949	. STRAP- 835 935	1	
- 11	1142377	STUD-CONTACT SHIELD	1	
- 12	1159542	SHIELD-SHIFT	1	
- 13	1164582	SCREW	2	

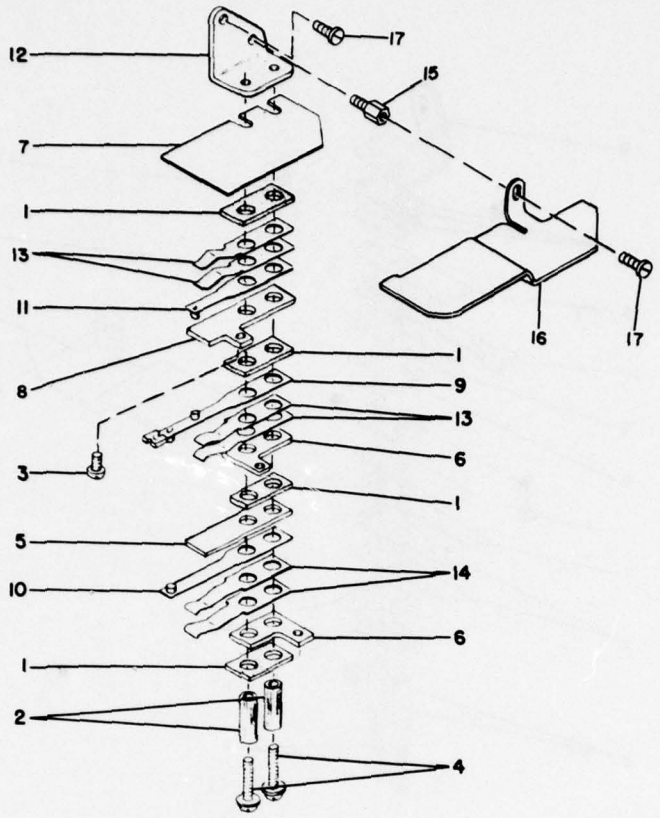


FIGURE 19. 1518 & 2970 CARRIER RETURN INTERLOCK CONTACT ASSEMBLY. SEE LIST 19.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		1518 & 2970 CARRIER RETURN INTERLOCK CONTACT ASSEMBLY		
19 -	1159589	CARRIER RETURN CONTACT ASSEMBLY USED ONLY ON MACHINES 1518 AND 2970 FOR ALL OTHER MACHINES SEE LIST 18 SEE FIGURE 19 FOR ILLUSTRATION	REF	
- 1	37435	. INSULATOR,PLATE	4	
- 2	105052	. INSULATOR-SCREW NO. 5 X 1/2 LG	2	
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	3	
- 4	173206	. SCREW,ASMD WASHER-RH 5-40 X 21/32 LG	2	
- 5	326119	. SUPPORT	1	
- 6	339109	. TERMINAL-CONTACT SPRING	2	
- 7	1108350	. SHIELD	1	
- 8	1128743	. TERMINAL	1	
- 9	1128744	. STRAP ASSEMBLY	1	
- 10	1128745	. CONTACT-SHIFT N/O	1	
- 11	1128746	. STRAP ASSEMBLY	1	
- 12	1159556	. BRACKET	1	
- 13	1135466	. BACKUP-CONTACT	4	
- 14	1135467	. BACKUP-CONTACT	2	
- 15	1142377	STUD-CONTACT SHIELD	1	
- 16	1159542	SHIELD-SHIFT	1	
- 17	1164582	SCREW	2	

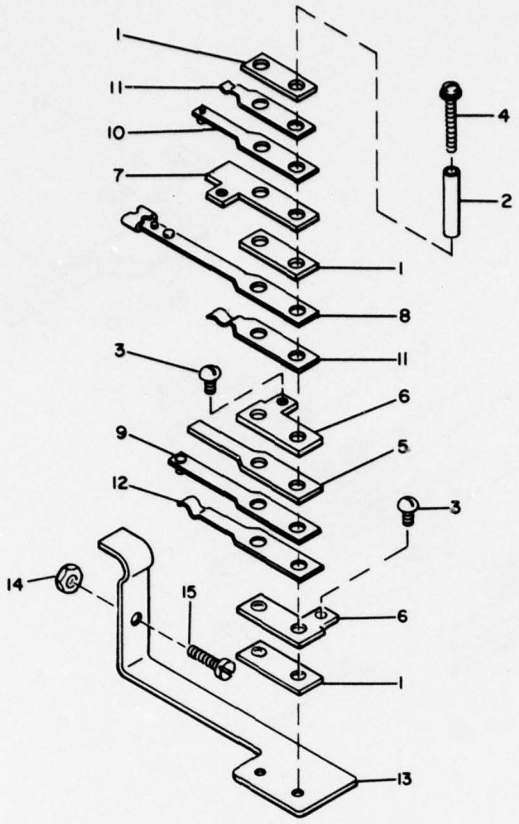


FIGURE 20. 2741 ATTENTION CONTACT ASSEMBLY. SEE LIST 20.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		2741 ATTENTION CONTACT ASSEMBLY		
20 -	1176513	ATTENTION CONTACT ASSEMBLY USED ONLY ON MACHINES 2741 SEE FIGURE 20 FOR ILLUSTRATION	REF	
- 1	37435	. INSULATOR,PLATE	4	
- 2	100229	. INSULATOR-SCREW NO. 5 X 1/2 LG	2	
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	3	
- 4	173205	. SCREW,ASMD WASHER-RH 5-40 X 21/32 LG	2	
- 5	326119	. SUPPORT	1	
- 6	339109	. TERMINAL-CONTACT SPRING	2	
- 7	1128743	. TERMINAL	1	
- 8	1128744	. STRAP ASSEMBLY	1	
- 9	1128745	. CONTACT-SHIFT N/O	1	
- 10	1128746	. STRAP ASSEMBLY	1	
- 11	1135466	. BACKUP-CONTACT	3	
- 12	1135467	. BACKUP-CONTACT	1	
- 13	1176514	. BRACKET-ATT MTG	1	
- 14	37913	NUT-HEX 4-40 X .250 ID	1	
- 15	1164690	SCREW,MACH-BINDING HD 4-40 X 0.312 LG	1	

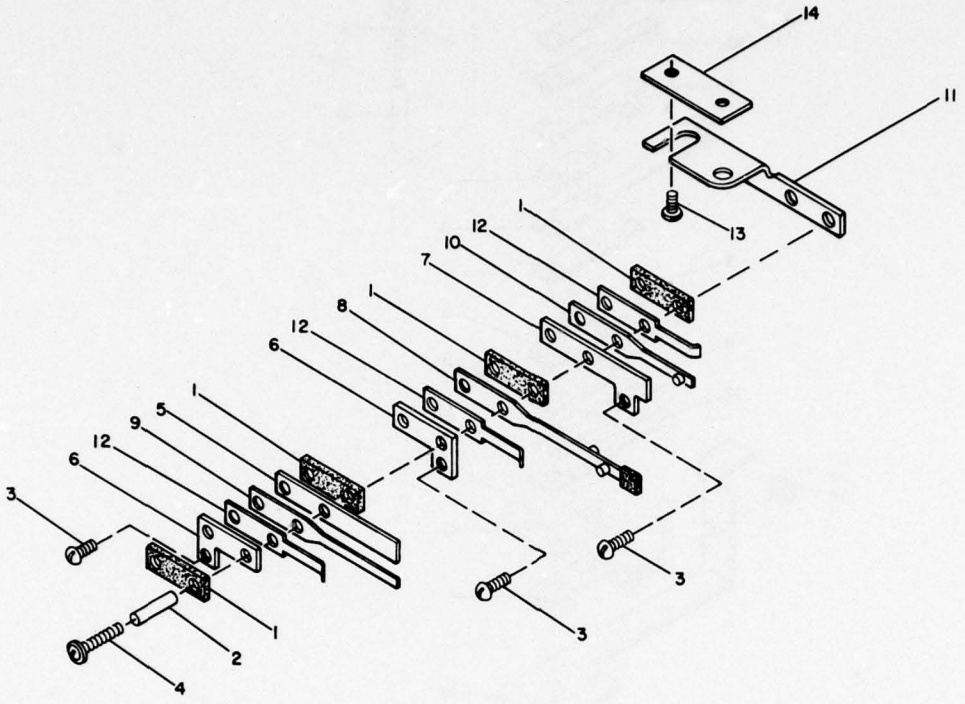


FIGURE 21. 1518 LOCK MECHANISM CONTACT ASSEMBLY. SEE LIST 21.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		1518 LOCK MECHANISM CONTACT ASSEMBLY		
21 -	1128896	LOCK MECHANISM CONTACT ASSEMBLY USED ONLY ON MACHINES 1518 SEE FIGURE 21 FOR ILLUSTRATION	REF	
- 1	37435	. INSULATOR,PLATE	4	
- 2	100229	. INSULATOR-SCREW NO. 5 X 1/2 LG	2	
- 3	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	3	
- 4	173205	. SCREW,ASMD WASHER-RH 5-40 X 21/32 LG	2	
- 5	326119	. SUPPORT	1	
- 6	339109	. TERMINAL-CONTACT SPRING	2	
- 7	1128743	. TERMINAL	1	
- 8	1128744	. STRAP ASSEMBLY	1	
- 9	1128745	. CONTACT-SHIFT N/O	1	
- 10	1128746	. STRAP ASSEMBLY	1	
- 11	1128897	. BRACKET	1	
- 12	1135466	. BACKUP-CONTACT	3	
- 13	236550	SCREW,MACH-BIND HD 4-40 X 0.375 LG	2	
- 14	1128882	SPACER	1	

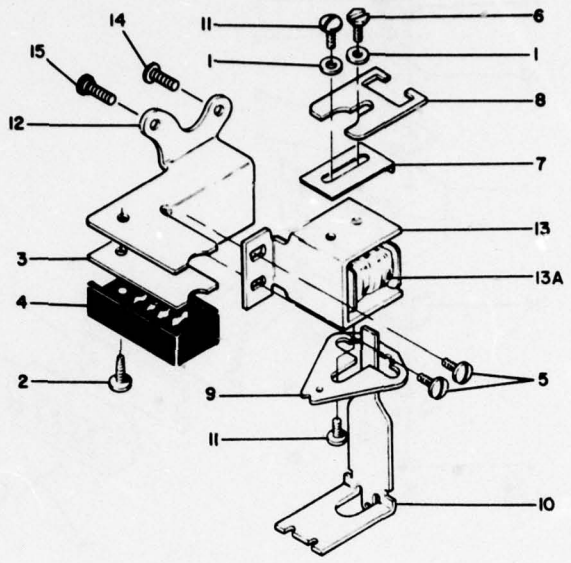


FIGURE 22. EARLY STYLE 2740 AND 2741 SHIFT UNLOCK MAGNET ASSEMBLY. SEE LIST 22.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		EARLY STYLE 2740 AND 2741 SHIFT UNLOCK MAGNET ASSEMBLY		
22 -	1176900	SHIFT UNLOCK MAGNET ASSEMBLY USED ONLY ON MACHINES 2740 AND 2741 EARLY STYLE - SEE LIST 23 FOR LATE STYLE	REF	
		2740 AND 2741 AND ALL OTHER MACHINES EXCEPT 1518 SEE FIGURE 22 FOR ILLUSTRATION		
- 1	35534	. WASHER	2	
- 2	198363	. SCREW,THD FORMING-BIND HD NO. 4 X 1/2 LG	1	
- 3	317766	. INSULATOR-TERMINAL BLOCK	1	
- 4	317767	. TERMINAL BOARD ASM- 12 FEEDTHRU TERMINAL	1	
- 5	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 6	1127785	. SCREW,MACH-HEX HD 4-40 X 0.156 LG	1	
- 7	1128965	. RESIDUAL	1	
- 8	1128966	. BACKSTOP	1	
- 9	1128967	. PLATE	1	
- 10	1128968	. ARMATURE	1	
- 11	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	2	
- 12	1176901	. BRACKET-SHIFT UNLOCK	1	
- 13	1176975	. YOKE ASM	1	
- 13A	1128964	. COIL	1	
- 14	1117759	SCREW,MACH-BINDING HD 6-32 X 0.188 LG	1	
- 15	1124411	SCREW-SHOULDER	1	

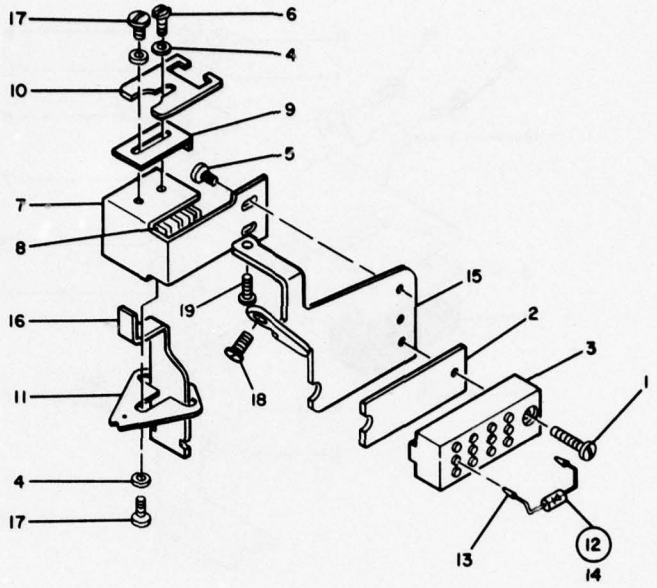


FIGURE 23. SHIFT UNIOCK MAGNET ASSEMBLY. SEE LIST 23.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		SHIFT UNLOCK MAGNET ASSEMBLY		
23 -	1145621	MAGNET ASSEMBLY-SHIFT UNICCK USED ON MACHINES EXCEPT 1518 - FOR EARLY STYLE 2740 AND 2741 SEE LIST 22 SEE FIGURE 23 FOR ILLUSTRATION	REF	
- 1	438550	. SCREW,THD FORMING-BIND HD NO. 4 X 1/2 LG	1	
- 2	31776€	. INSULATOR-TERMINAL BLOCK	1	
- 3	317767	. TERMINAL BOARD ASM- 12 FEEDTHRU TERMINAL	1	
- 4	355341	. WASHER,FLAT	3	
- 5	43856€	. SCREW,MACH-BIND HD 6-32 X .125 LG	2	
- 6	1127785	. SCREW,MACH-HEX HD 4-40 X 0.156 LG	1	
- 7	112896Ə	. YOKE	1	
- 8	1128964	. COIL ASSEMBLY	1	
- 9	1128965	. RESIDUAL	1	
- 10	112896€	. BACKSTOP	1	
- 11	112896Ɇ	. PLATE	1	
- 12	1135573	. DIODE ASSEMBLY (BIACK LEAD ANODE)	1	
- 13	187243	. . TERMINAL, QUICK DISCONNECT	2	
- 14	2106333	. . SEMICONDUCTOR DEVICE	1	
- 15	1145622	. BRACKET	1	
- 16	1145623	. ARMATURE	1	
- 17	116457€	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	2	
- 18	116457Ƽ	SCREW,MACH-BIND HD 6-32 X 0.375 LG	1	
- 19	1164576	SCREW	1	

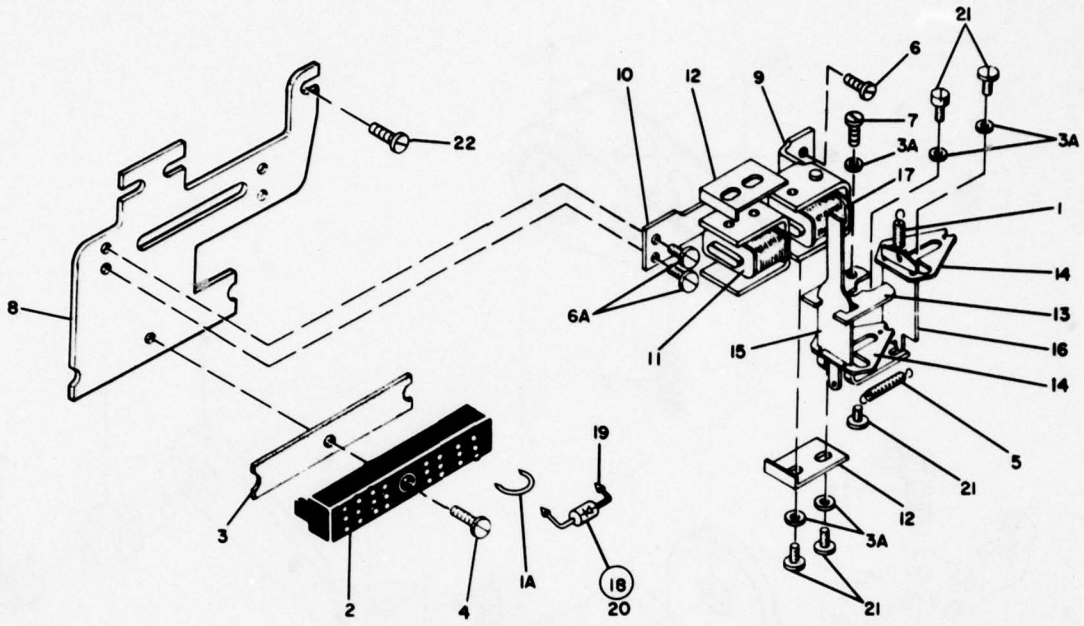


FIGURE 24. SHIFT MAGNET ASSEMBLY. SEE LIST 24.

LIST AND INDEX NO.	PART NO.	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		SHIFT MAGNET ASSEMBLY		
24 -	1135302	SHIFT MAGNET ASSEMBLY SEE FIGURE 24 FOR ILLUSTRATION	REF	
- 1	123552	. SPRING,HELICAL,EXTENSION- 21 TURNS	REF	
- 1A	205329	. JUMPER-BRASS,3/16	2	
- 2	302090	. CONNECTOR,RECP,ELEC- 24 FEMALE CONTACTS	1	
- 3	302131	. STRIP-TERMINAL BLOCK INSULATOR	1	
- 3A	355341	. WASHER,FLAT	5	
- 4	438549	. SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
- 5	1072126	. SPRING,HELICAL,EXTENSION	1	
- 6	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 6A	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 6A	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG USED ABOVE SN 4622383	2	
- 7	1127785	. SCREW,MACH-HEX HD 4-40 X 0.156 LG	1	
- 8	1128958	. BRACKET	1	
- 9	1128959	. YOKE AND CORE ASSEMBLY	1	
- 10	1128962	. YOKE	1	
- 11	1128964	. COIL ASSEMBLY	1	
- 12	1128965	. RESIDUAL	2	
- 13	1128966	. BACKSTOP	1	
- 14	1128967	. PLATE	2	
- 15	1128968	. ARMATURE	1	
- 16	1128969	. ARMATURE	1	
- 17	1135134	. COIL ASSEMBLY, PRINT MAGNET	1	
- 18	1135573	. DIODE ASSEMBLY (BLACK LEAD ANODE)	1	
- 19	187243	. . TERMINAL, QUICK DISCONNECT	2	
- 20	2106333	. . SEMICONDUCTOR DEVICE	1	
- 21	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	5	
- 22	1164576	. SCREW	3	

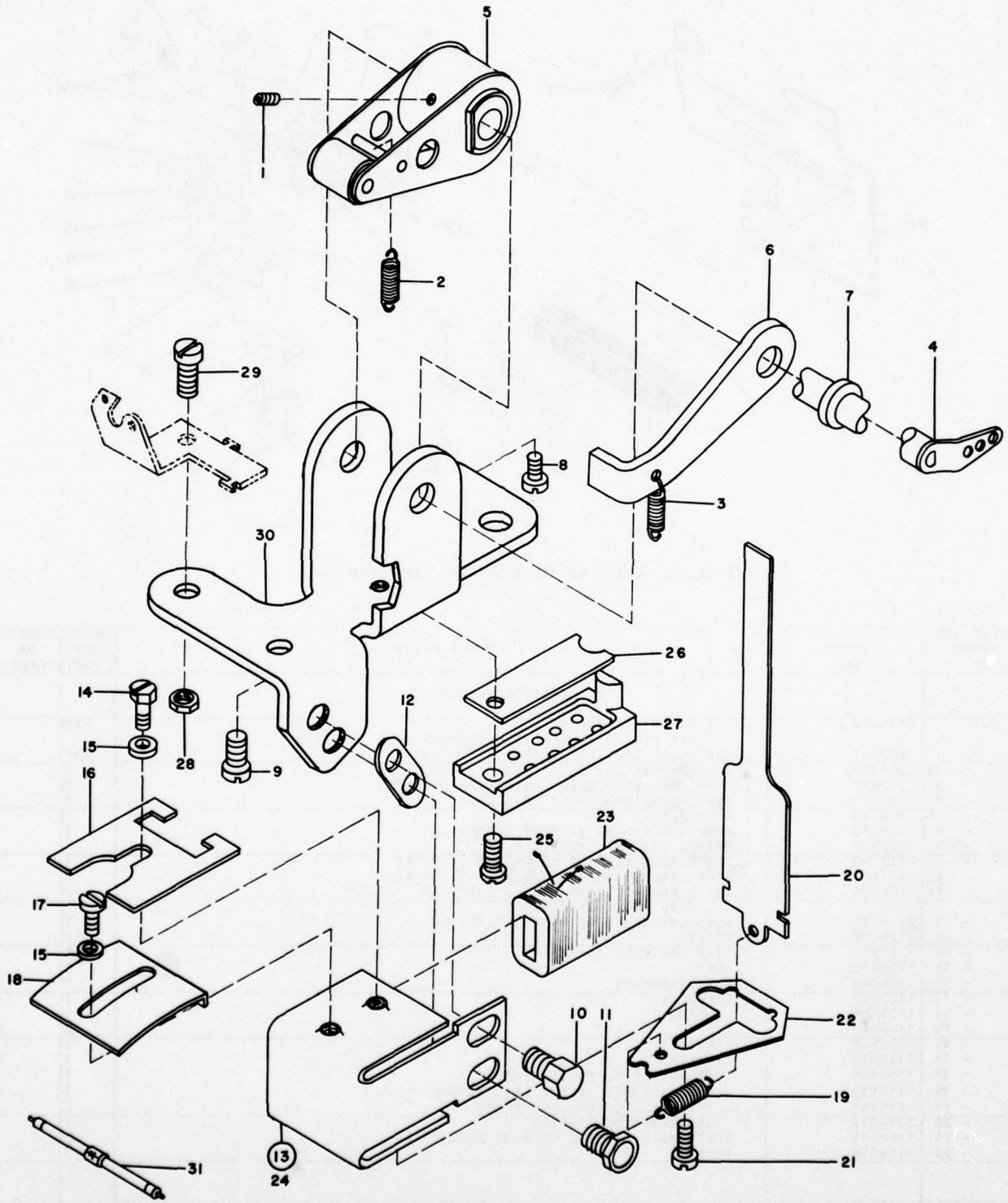
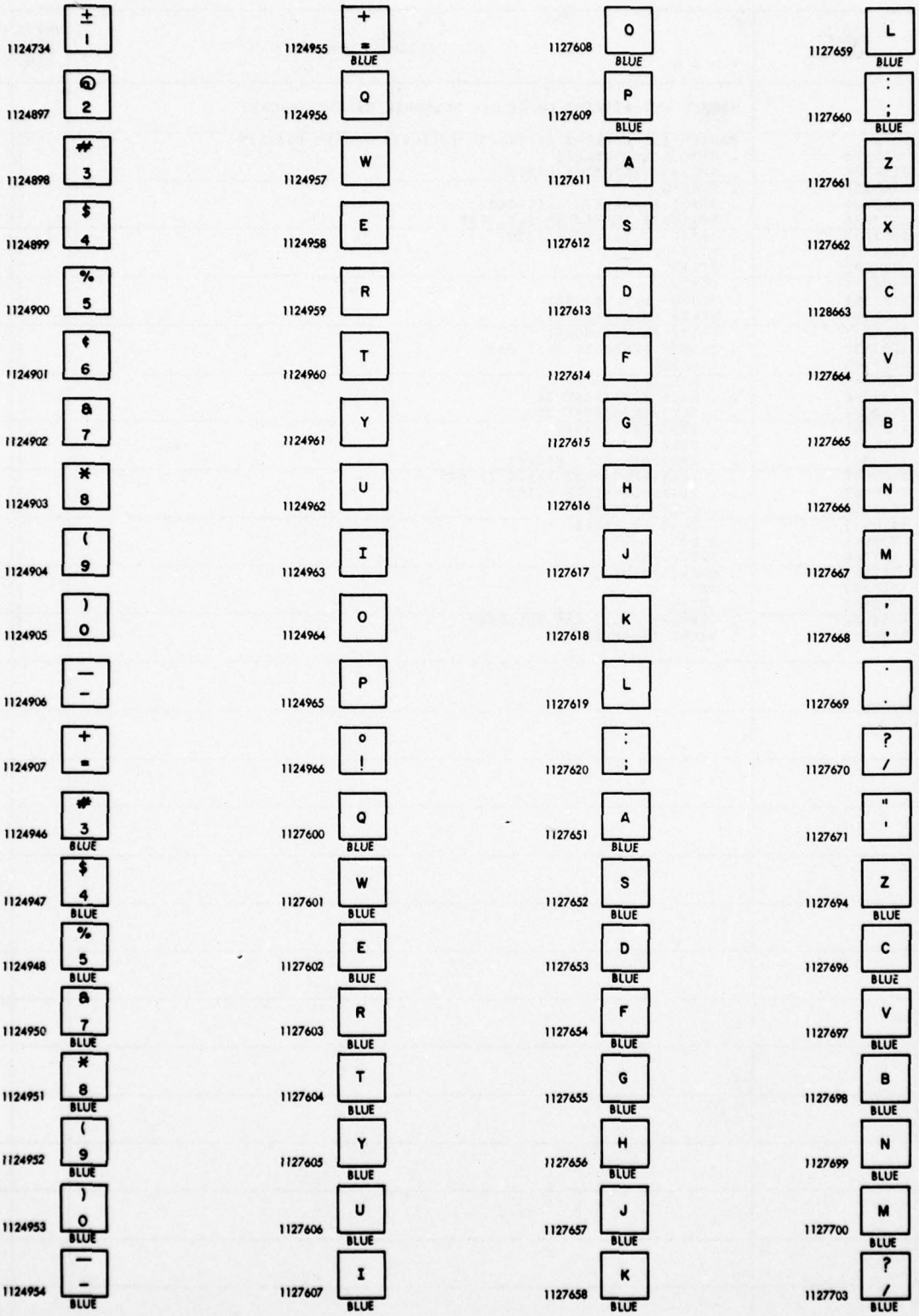


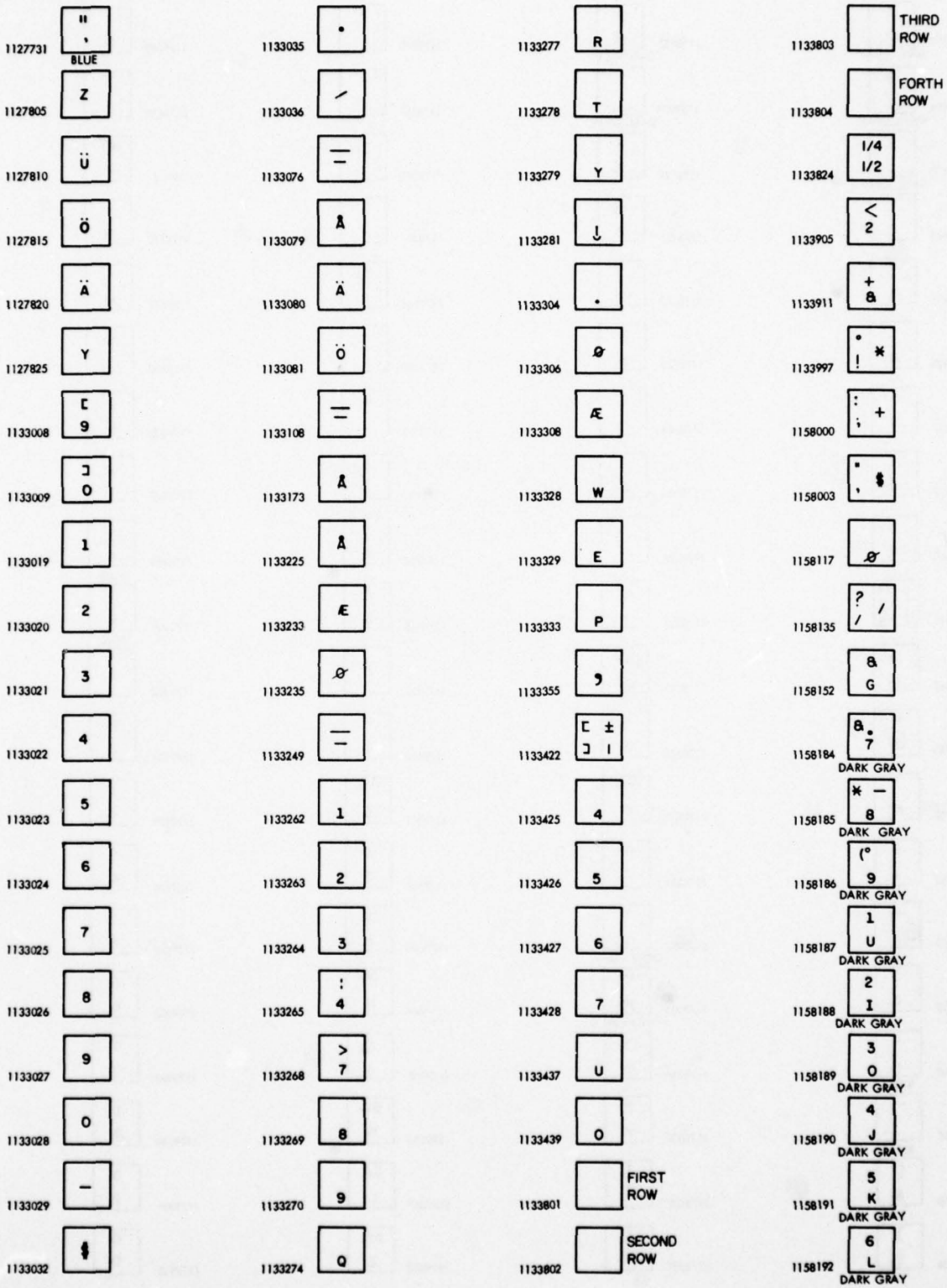
FIGURE 25. MAGNET ASM-REVERSE INDEX CAM FOLLOWER MAGNET BRACKET. SEE LIST 25.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		MAGNET ASM-REVERSE INDEX CAM FOLLOWER MAGNET BRACKET		
25 -	NO NO.	MAGNET ASM-REVERSE INDEX CAM FOLLOWER MAGNET BRACKET	NP	
- 1	257971	. SETSCREW-HEADLESS	1	
- 2	112858C	. SPRING-SELECTION LATCH	1	
- 3	1145202	. SPRING	1	
- 4	1203640	. SHAFT ASSEMBLY- R.I. CAM	1	
- 5	1203630	. FOLLOWER ASSEMBLY- R.I. CAM	1	
- 6	1203639	. LATCH- R.I. CHECK RING	1	
- 7	1187163	. WICK-OIL	1	
- 8	438622	. SCREW	1	
- 9	1164579	. SCREW	1	
- 10	1187152	. SCREW- R.I. MAGNET	1	
- 11	1164940	. SCREW R.I. MAGNET	1	
- 12	1203611	. PLATE-MAGNET MOUNT	1	
- 13	1203620	. MAGNET ASSEMBLY- R.I CAM	1	
- 14	1127785	. . SCREW	1	
- 15	355341	. . WASHER	2	
- 16	1128966	. . BACKSTOP-ARMATURE	1	
- 17	1164578	. . SCREW-RESIDUAL MTG	1	
- 18	1128965	. . RESIDUAL-MAGNET	1	
- 19	150735	. . SPRING	1	
- 20	1203623	. . ARMATURE-R.I. MAGNET	1	
- 21	1164578	. . SCREW-ARMATURE PIVOT PL MTG	1	
- 22	1128967	. . PLATE-ARMATURE PIVOT	1	
- 23	1128964	. . COIL ASSEMBLY	1	
- 24	1128962	. . YOKE ASSEMBLY	1	
- 25	438549	. SCREW	1	
- 26	317766	. INSULATOR	1	
- 27	317767	. TERMINAL BLOCK	1	
- 28	257187	. NUT	1	
- 29	322550	. SCREW	1	
- 30	1203624	. BRACKET- R.I. CAM FOLLOWER	1	
- 31	1135573	. DIODE ASSEMBLY	1	



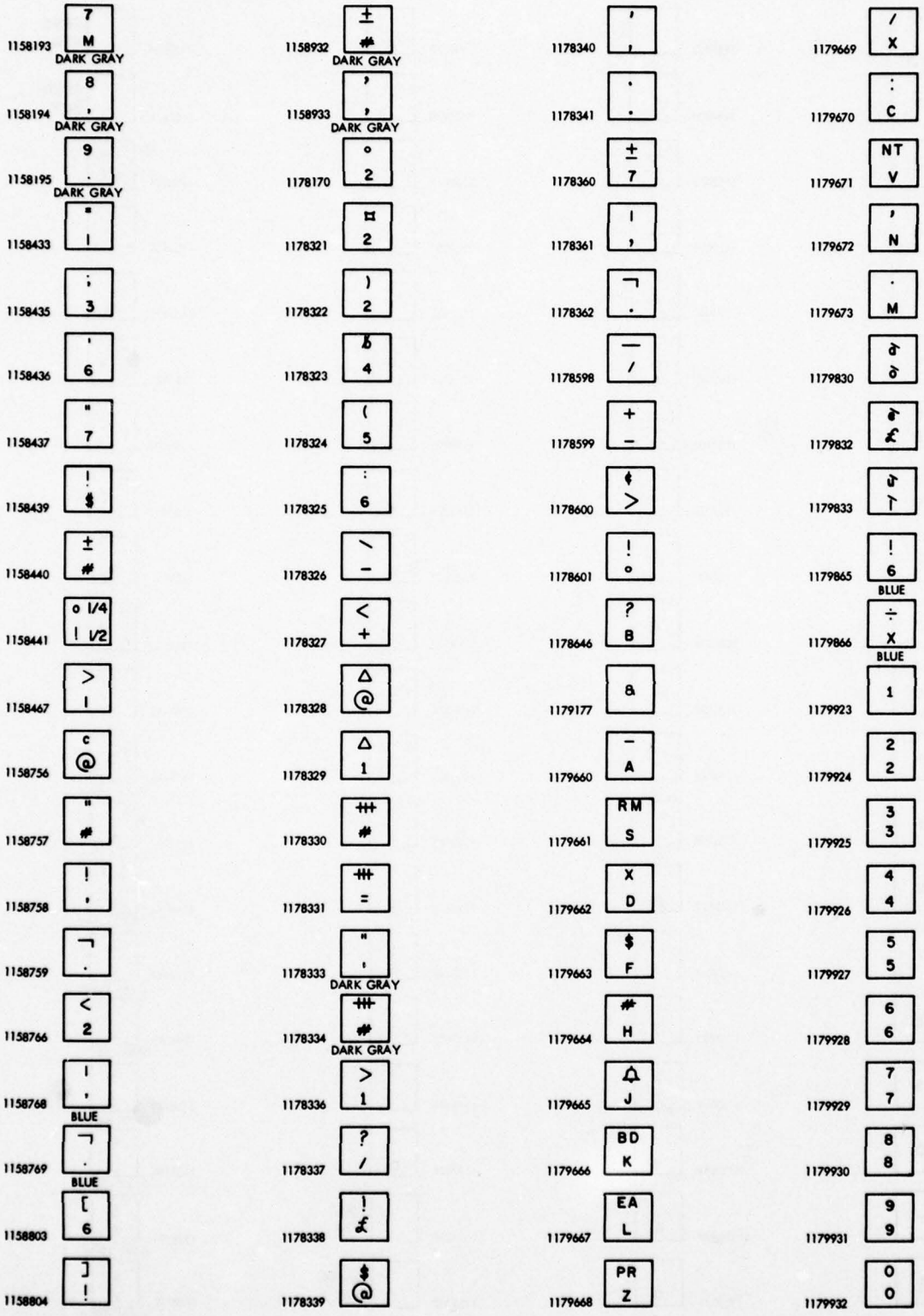
ALL KEYS ARE GRAY EXCEPT AS NOTED

FIGURE 26. KEYBUTTONS. SHEET 1 OF 5.



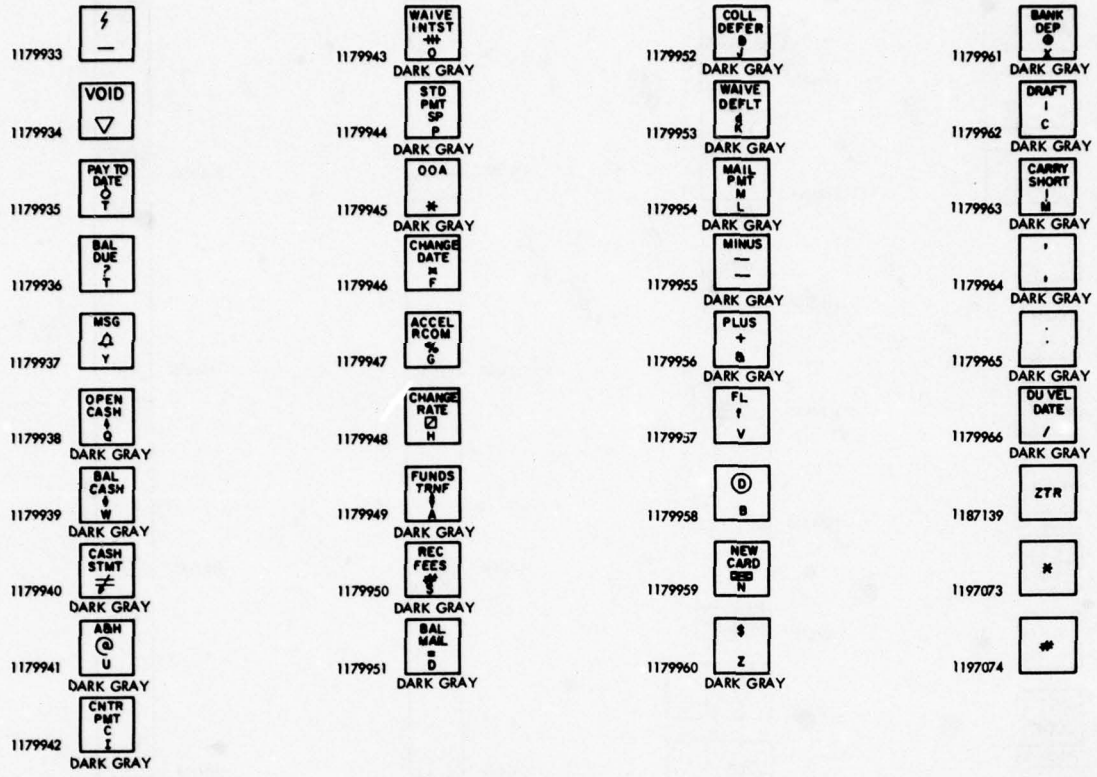
ALL KEYS ARE GRAY EXCEPT AS NOTED

FIGURE 26. KEYBUTTONS. SHEET 2 OF 5.



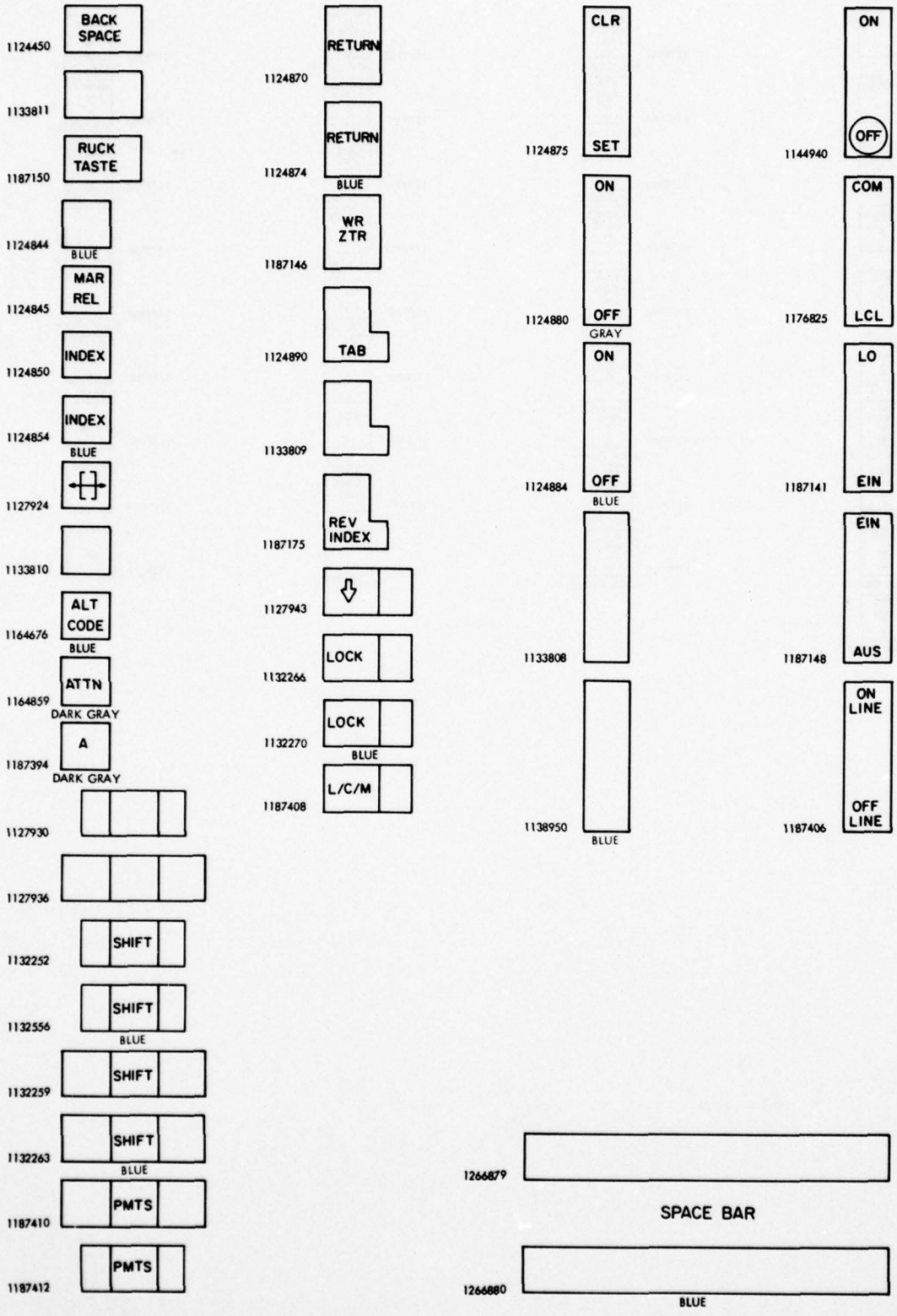
ALL KEYS ARE GRAY EXCEPT AS NOTED

FIGURE 26. KEYBUTTONS. SHEET 3 OF 5.



ALL KEYS ARE GRAY EXCEPT AS NOTED

FIGURE 26. KEYBUTTONS. SHEET 4 OF 5.



ALL KEYS ARE GRAY EXCEPT AS NOTED

FIGURE 26. KEYBUTTONS. SHEET 5 OF 5.

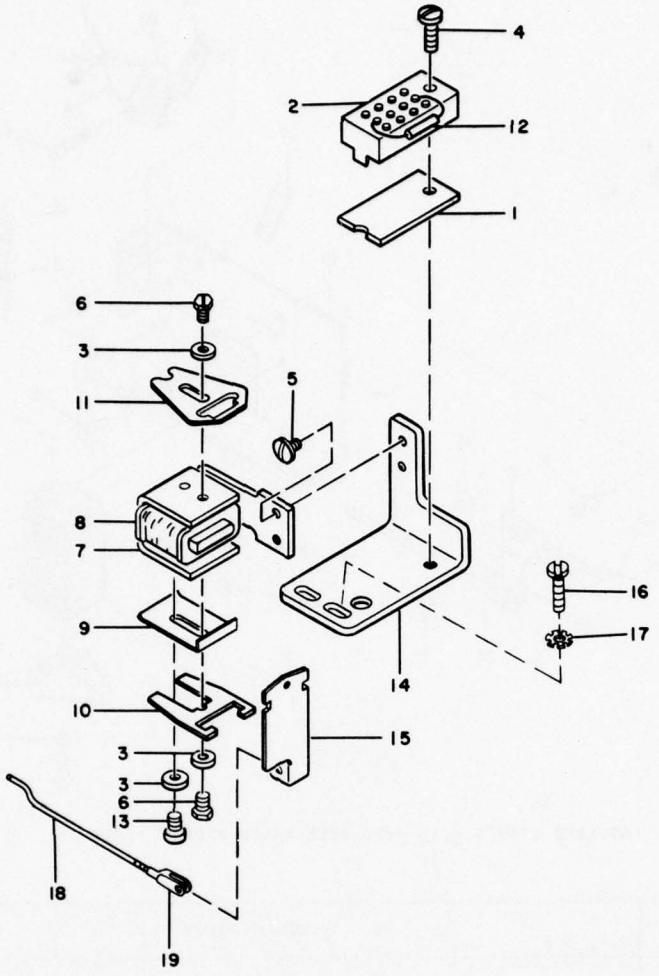


FIGURE 27. 1980 AND 2740-2 D.I. FEED ROLL CYCLE MAGNET ASSEMBLY. SEE LIST 27.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		1980 AND 2740-2 D.I. FEED ROLL CYCLE MAGNET ASSEMBLY		
27 -	1187386	MAGNET ASSEMBLY-FR CYCLE USED ONLY ON MACHINES 1980 AND 2740-2 WITH DOCUMENT INSERTION SEE FIGURE 27 FOR ILLUSTRATION	REF	
- 1	317766	. INSULATOR-TERMINAL BLOCK	1	
- 2	317767	. TERMINAL BOARD ASM- 12 FEEDTHRU TERMINAL	1	
- 3	355341	. WASHER,FLAT	3	
- 4	438549	. SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
- 5	438566	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 6	108114	. SCREW,MACH-HEX HD 4-40 X 0.156 LG	2	
- 7	1128962	. YOKE	1	
- 8	1203608	. COIL ASSEMBLY	1	
- 9	1128965	. RESIDUAL	1	
- 10	1128966	. BACKSTOP	1	
- 11	1128967	. PLATE	1	
- 12	1160777	. DIODE ASSEMBLY	1	
- 13	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 14	1187384	. BRACKET-FRAME CAM MTG	1	
- 15	1187385	. ARMATURE-FR RELEASE MAGNET	1	
- 16	236550	SCREW,MACH-BIND HD 4-40 X 0.375 LG	2	
- 17	150209	WASHER,STAR- 0.115, 0.270 H	2	
- 18	1000223	LINK, CONNECTING	1	
- 19	1070020	CLEVIS-LINK	1	

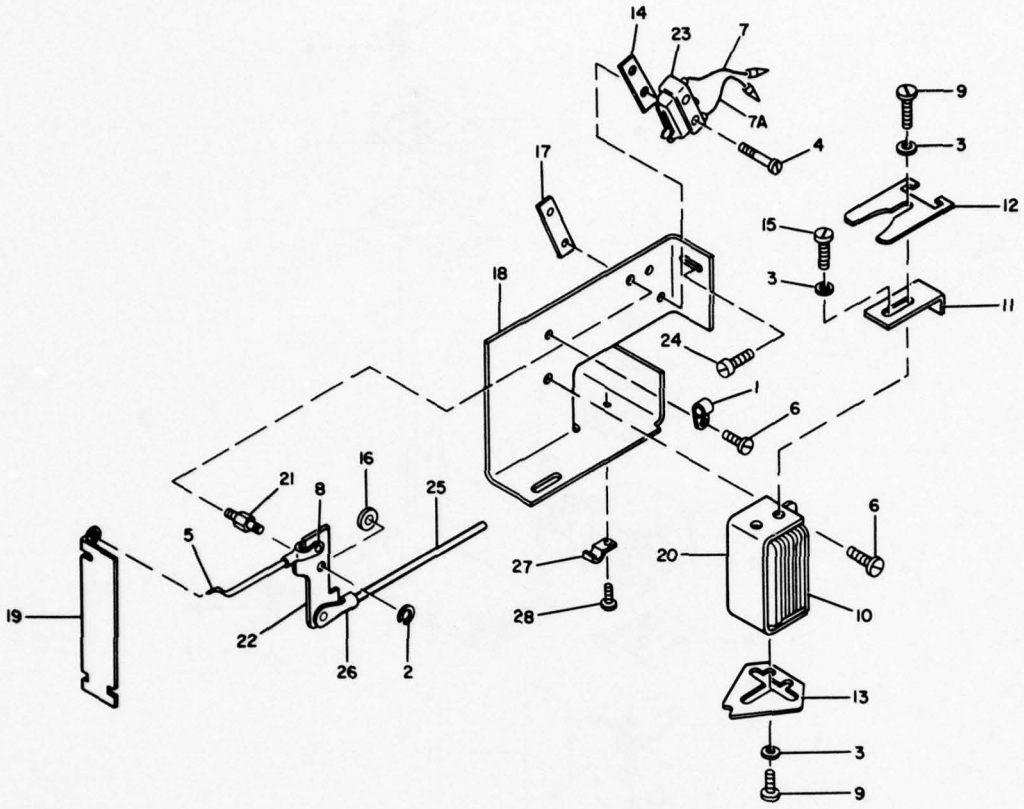


FIGURE 28. 1980 AND 2740-2 D.I. FEED ROLL LATCH MAGNET ASSEMBLY. SEE LIST 28.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		1980 AND 2740-2 D.I. FEED ROLL LATCH MAGNET ASSEMBLY		
28 -	1187455	MAGNET ASSEMBLY-FR LATCH USED ONLY ON MACHINES 1980 AND 2740-2 WITH DCC. INSERT. SEE FIGURE 28 FOR ILLUSTRATION	REF	
- 1	190352	. CLIP, VOLTAGE CABLE	1	
- 2	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK	1	
- 3	355341	. WASHER,FLAT	3	
- 4	438542	. SCREW,MACH-BIND HD 2-56 X 1/2 LG-FURNISHED WITH 5363	2	
- 5	1014536	. LINK	1	
- 6	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	3	
- 7	1119876	. JUMPER-BLUE	AR	
- 7A	317930	. JUMPER-YELLOW	AR	
- 8	1125828	. CLEVIS	1	
- 9	1127785	. SCREW,MACH-HEX HD 4-40 X 0.156 LG	2	
- 10	1128910	. COIL ASSEMBLY	1	
- 11	1128965	. RESIDUAL	1	
- 12	1128966	. BACKSTOP	1	
- 13	1128967	. PLATE	1	
- 14	1135868	. INSULATOR-INDICATOR SWITCH-FURNISHED WITH 5363690	1	
- 15	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 16	1166764	. WASHER-ABSORBENT SHIFT RELEASE	1	
- 17	1187340	. PLATE-SWITCH MTG	1	
- 18	1187392	. BRACKET-FR MAGNET	1	
- 19	1187456	. ARMATURE-FR LATCH	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
28 - 20	1187457	. YOKE ASSEMBLY-CORE FR LATCH	1	
- 21	1187459	. STUD-FR LATCH	1	
- 22	1187460	. BELLCRANK-FR LATCH	1	
- 23	5363690	. SWITCH-INDICATOR	1	
- 24	1164576	SCREW	3	
- 25	1187355	LINK-FEED ROLL LATCH	1	
- 26	1070020	CLEVIS-LINK	1	
- 27	334281	CLAMP-CABLE	1	
- 28	1164580	SCREW,MACH-BINDING HD 4-40 X 0.250 LG	1	

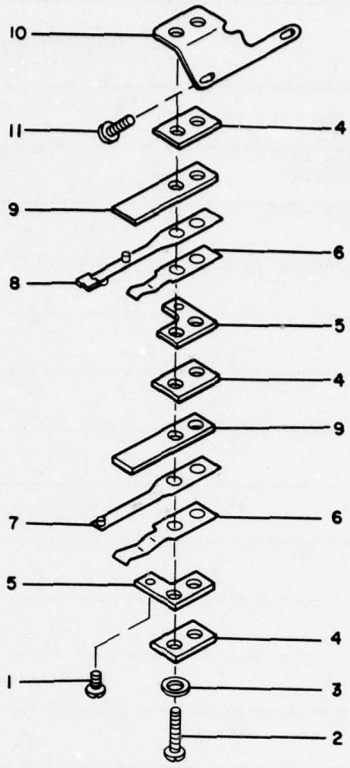


FIGURE 29. 2741 TYPAMATIC SPACE AND BACKSPACE CONTACT ASSEMBLY. SEE LIST 29.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		2741 TYPAMATIC SPACE AND BACKSPACE CONTACT ASSEMBLY		
29 -	1176589	SPACE AND BACKSPACE CONTACT ASSEMBLY USED ONLY ON MACHINES 2741 TYPAMATIC SEE FIGURE 29 FOR ILLUSTRATION	REF	
- 1	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	2	
- 2	173203	. SCREW,MACH-RD WASHER HD 5-40 X 17/32 LG	2	
- 3	100227	. INSULATOR-SCREW	2	
- 4	37435	. INSULATOR,PLATE	3	
- 5	339109	. TERMINAL-CONTACT SPRING	2	
- 6	1135467	. BACKUP-CONTACT	2	
- 7	1128745	. CONTACT-SHIFT N/O	1	
- 8	1176949	. STRAP- 835 93[illegible]	1	
- 9	326119	. SUPPORT	2	
- 10	1176590	. BRACKET-SPACE AND BACKSPACE CONTACT	1	
- 11	1164579	SCREW,MACH-BIND HD 6-32 X 0.375 LG	2	

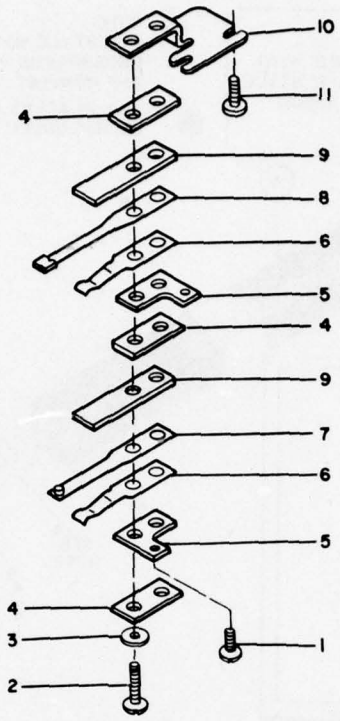


FIGURE 30. 2741 TYPAMATIC UNDERSCORE CONTACT ASSEMBLY. SEE LIST 30.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		2741 TYPAMATIC UNDERSCORE CONTACT ASSEMBLY		
30 -	1186048	UNDERSCORE CONTACT ASSEMBLY USED ONLY ON MACHINES 2741 TYPAMATIC SEE FIGURE 30 FOR ILLUSTRATION	REF	
- 1	118418	. SCREW,MACH-RH 5-40 X 5/32 LG	2	
- 2	173203	. SCREW,MACH-RD WASHER HD 5-40 X 17/32 LG	2	
- 3	100227	. INSULATOR-SCREW	2	
- 4	37435	. INSULATOR,PLATE	3	
- 5	339109	. TERMINAL-CONTACT SPRING	2	
- 6	1135467	. BACKUP-CONTACT	2	
- 7	1128745	. CONTACT-SHIFT W/O	1	
- 8	1176945	. STRAP- 835 935	1	
- 9	326119	. SUPPORT	2	
- 10	1186051	. BRACKET-UNDERSCORE CONTACT	1	
- 11	1164580	. SCREW,MACH-BINDING HD 4-40 X 0.250 LG	2	

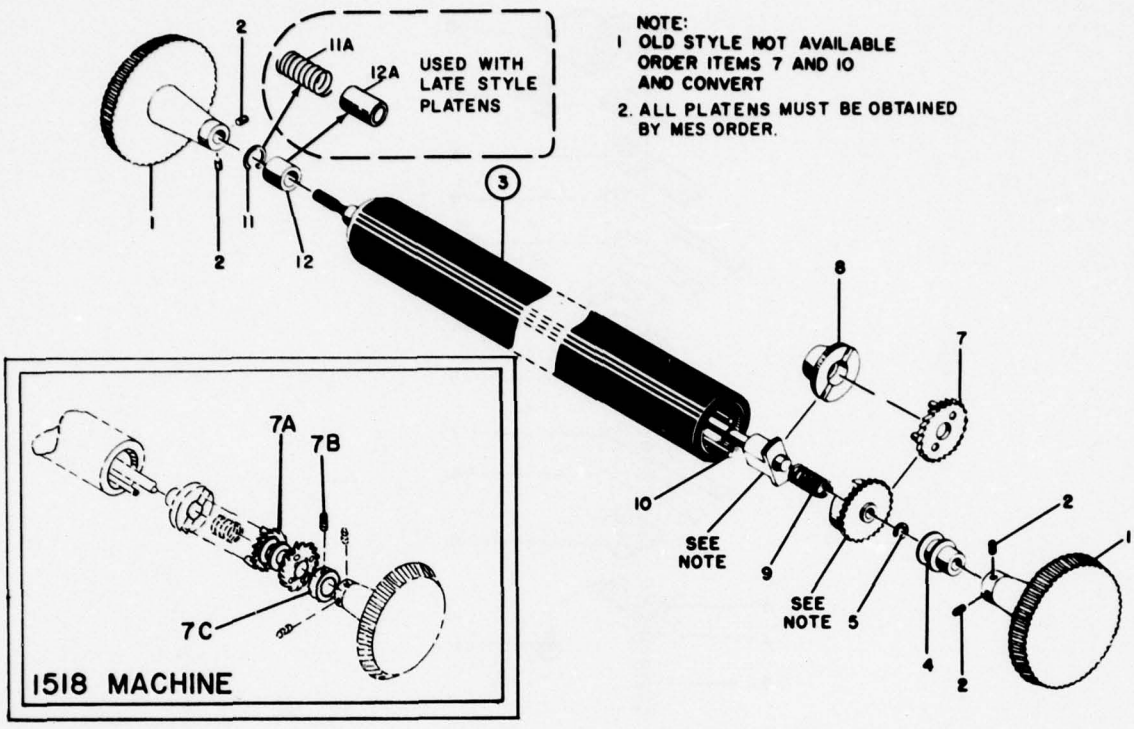
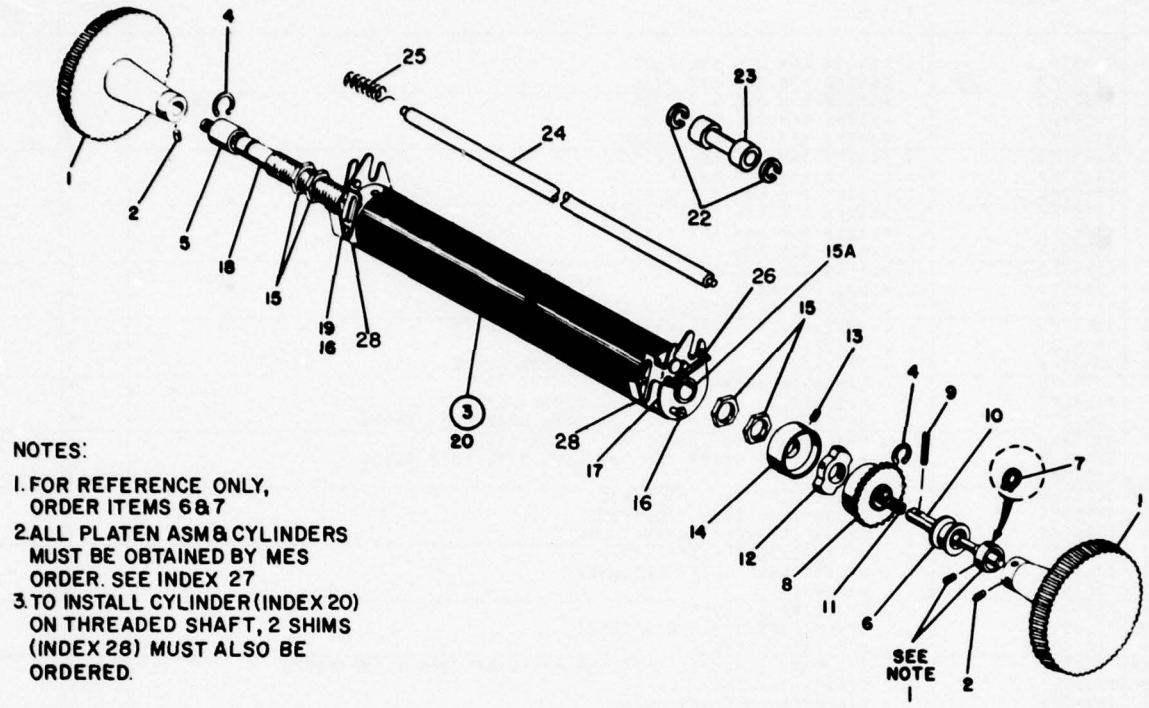


FIGURE 31. STANDARD PLATEN ASSEMBLIES. SEE LIST 31.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		STANDARD PLATEN ASSEMBLIES		
31 -	NO NO.	PLATEN GROUP-STD 15 IN. SEE FIGURE 31 FOR ILLUSTRATION	NP	
- 1	1135377	. KNOB,PLATEN-GRAY	2	
- 1	1159295	. KNOB,PLATEN-BLUE	2	
- 2	1175107	. SETSCREW	4	
- 3	1166977	. PLATEN ASM-STD 13 IN. 3-6 LPI- 1518	1	
- 3	1166976	. PLATEN ASM-STD 13 IN. 3-6 LPI ALL EXCEPT 1518	1	
- 3	1166992	. PLATEN ASM-STD 13 IN. 4-8 LPI ALL EXCEPT 1518 & 2970 MAY BE OBTAINED ON MES ORDER ONLY	1	
- 4	1138360	. . BUSHING-RH 15 INCH MACHINE	1	
- 5	1164850	. . CLIP-RETAINING	1	
- 7	1159549	. . RATCHET,PLATEN- 488 LPI 36 TEETH	1	
- 7	1164464	. . RATCHET,PLATEN- 386 LPI 54 TEETH	1	
- 7	1164463	. . RATCHET,PLATEN- 386 LPI 27 TEETH	1	
- 7A	1203615	. . RATCHET,PLATEN 386 LPI 54 TEETH- 1518	1	
- 7B	1175101	. . SETSCREW-1518	1	
- 7C	1171811	. . COLLAR-1518	1	
- 8	1164476	. . . DRIVER-RATCHET	1	
- 9	1138363	. . SPRING-PLATEN VAR	1	
- 10	1138358	. . PIN-PLATEN VAR	2	
- 10	1175577	. . PIN-PLATEN VAR.-LATE STYLE	1	
- 11	236571	. . RING,RETAINING-USED ON EARLY STYLE PLATEN ONLY	1	
- 11A	1142683	. . SPRING-LATE STYLE	1	
- 12	1123549	. . BUSHING-LH SHAFT-USED ON EARLY STYLE PLATEN ONLY	1	
- 12A	1138990	. . BUSHING-LH-LATE STYLE	1	



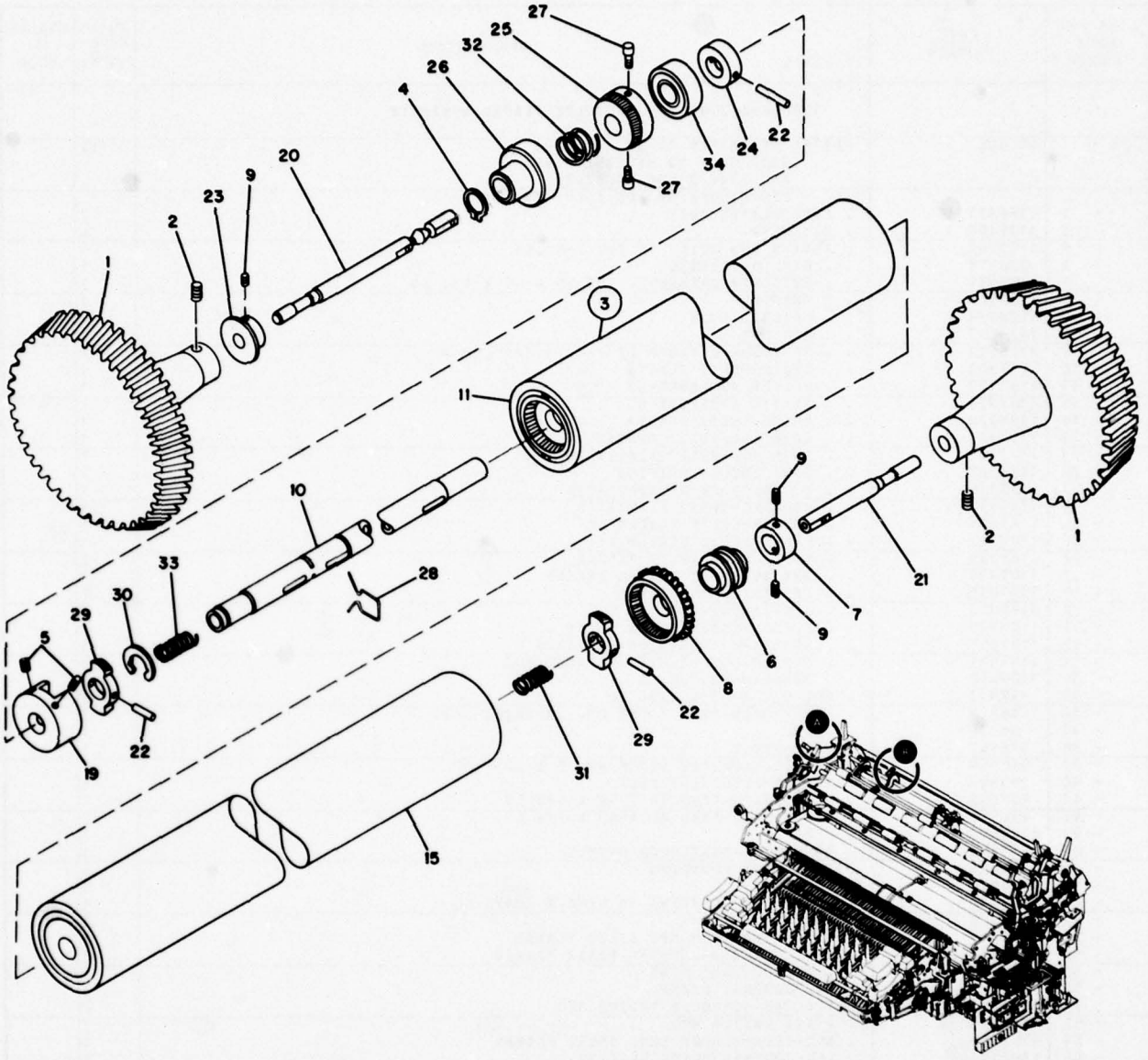
NOTES:

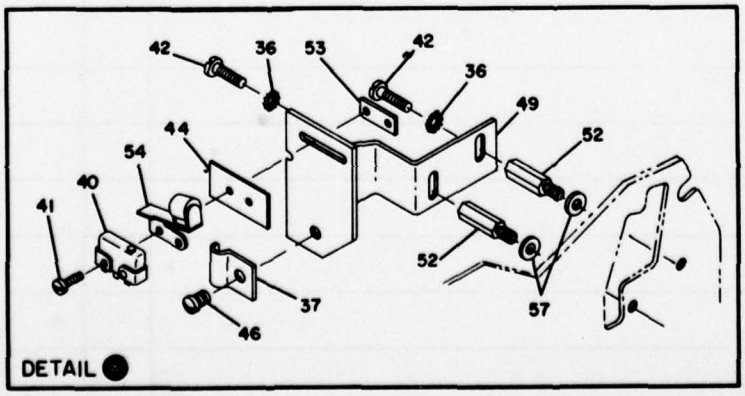
1. FOR REFERENCE ONLY, ORDER ITEMS 6&7
2. ALL PLATEN ASM& CYLINDERS MUST BE OBTAINED BY MES ORDER. SEE INDEX 27
3. TO INSTALL CYLINDER (INDEX 20) ON THREADED SHAFT, 2 SHIMS (INDEX 28) MUST ALSO BE ORDERED.

FIGURE 32. PIN FEED PLATEN ASSEMBLIES. SEE LIST 132.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		PIN FEED PLATEN ASSEMBLIES		
32 -	NO NO.	PIN FEED PLATEN ASSEMBLY SEE FIGURE 32 FOR ILLUSTRATION	NP	
- 1	1135065	. KNOB,GRAY-11" MACHINES	2	
- 1	1159353	. KNOB,BLUE-RH VFC	1	
- 1	1135377	. KNOB,GRAY-15" MACHINES	2	
- 1	1159295	. KNOB,BLUE-11" MACHINES	2	
- 1	1135570	. KNOB,BLUE-LH VFC	1	
- 2	257968	. SETSCREW	4	
- 3	1175422	. PLATEN ASM 366 LPI 5.25	1	
- 3	1203877	. PLATEN ASM 468 IPI 13.875	1	
- 3	1141977	. PLATEN ASM 366 LPI 9.375	1	
- 3	1135324	. PLATEN ASM 366 LPI 9.875	1	
- 3	1135327	. PLATEN ASM 366 LPI 10.125	1	
- 3	1135330	. PLATEN ASM 366 IPI 11.250	1	
- 3	1135333	. PLATEN ASM 366 LPI 13.125	1	
- 3	1135754	. PLATEN ASM 366 LPI 10.00	1	
- 3	1135755	. PLATEN ASM 366 LPI 11.50	1	
- 3	1187673	. PLATEN ASM 366 LPI 12.50	1	
- 3	1203876	. PLATEN ASM 366 LPI 13.875	1	
- 3	1135756	. PLATEN ASM 468 LPI 10.00	1	
- 3	1135757	. PLATEN ASM 468 LPI 10.125	1	
- 3	1135758	. PLATEN ASM 468 LPI 11.250	1	
- 3	1135759	. PLATEN ASM 468 LPI 11.500	1	
- 3	1135760	. PLATEN ASM 468 LPI 13.125	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
32 - 3	1135761	. PLATEN ASM 386 LPI 6.00	1	
- 3	1135763	. PLATEN ASM 386 LPI 7.50	1	
- 3	1135765	. PLATEN ASM 386 LPI 8.00	1	
- 3	1135767	. PLATEN ASM 386 LPI 9.00	1	
- 3	1141976	. PLATEN ASM 386 LPI 5.250	1	
- 3	1187674	. PLATEN ASM 468 LPI 12.50	1	
- 3	1135762	. PLATEN ASM 468 LPI 6.00	1	
- 3	1135764	. PLATEN ASM 468 LPI 7.50	1	
- 3	1135766	. PLATEN ASM 468 LPI 8.00	1	
- 3	1175423	. PLATEN ASM 468 LPI 9.375	1	
- 3	1159927	. PLATEN ASM 468 LPI 9.875	1	
- 3	1135768	. PLATEN ASM 468 LPI 9.00	1	
- 4	236571	. RING,RETAINING	2	
- 5	1123549	. . BUSHING,LH SHAFT,EARLY STYLE	1	
- 5	1203747	. . BUSHING,LH SHAFT,LATE STYLE-HEX SHAFT	1	
- 6	1128523	. . BUSHING,RH SHAFT,EARLY STYLE	1	
- 6	1203743	. . BUSHING,RH SHAFT,LATE STYLE-HEX SHAFT	1	
- 7	311072	. . RING,RETAINING	1	
- 8	1128527	. . RATCHET,27 TEETH 386 LPI EARLY STYLE	1	
- 8	1203737	. . RATCHET,27 TEETH 386 LPI LATE STYLE-HEX SHAFT	1	
- 8	1135192	. . RATCHET,36 TEETH 468 LPI EARLY STYLE	1	
- 8	1203738	. . RATCHET 36 TEETH 468 LPI LATE STYLE-HEX SHAFT	1	
- 9	1128526	. . PIN ROLL	1	
- 10	1128525	. . PUSHROD,11 INCH MACHINES	1	
- 10	1135337	. . PUSHROD,15 INCH MACHINES	1	
- 11	109056E	. . SPRING,HELICAL COMPRESSION	1	
- 12	1128528	. . DRIVER,EARLY STYLE	1	
- 12	1203745	. . DRIVER,LATE STYLE-HEX SHAFT	1	
- 13	257965	. . SETSCREW	2	
- 14	1128533	. . GUIDE,EARLY STYLE	1	
- 14	1203742	. . GUIDE,LATE STYLE-HEX SHAFT	1	
- 15	308459	. . NUT,EARLY STYLE	4	
- 15A	257957	. . SETSCREW,PINWHEEL RETAINER-HEX SHAFT-NOT ILLUSTRATED	2	
- 16	1100951	. . SCREW,PINWHEEL	2	
- 17	1128522	. . PINWHEEL,RH,EARLY STYLE	1	
- 17	1203781	. . PINWHEEL,RH,LATE STYLE-HEX SHAFT	1	
- 18	1128531	. . SHAFT,11 INCH MACHINES EARLY STYLE	1	
- 18	1203780	. . SHAFT,11 INCH MACHINES LATE STYLE-HEX SHAFT	1	
- 18	1135338	. . SHAFT,15 INCH MACHINES EARLY STYLE	1	
- 18	1203744	. . SHAFT,15 INCH MACHINES LATE STYLE-HEX SHAFT	1	
- 19	1128521	. . PINWHEEL,LH, EARLY STYLE	1	
- 19	1203782	. . PINWHEEL,LH, LATE STYLE-HEX SHAFT	1	
- 20	1203934	. . CYLINDER 5.250 PTP LATE STYLE	1	
- 20	1203935	. . CYLINDER 6.00 PTP LATE STYLE	1	
- 20	120393E	. . CYLINDER 7.50 PTP LATE STYLE	1	
- 20	1203937	. . CYLINDER 8.00 PTP LATE STYLE	1	
- 20	1203938	. . CYLINDER 9.00 PTP LATE STYLE	1	
- 20	1203939	. . CYLINDER 9.375 PTP LATE STYLE	1	
- 20	1203940	. . CYLINDER 9.875 PTP LATE STYLE	1	
- 20	1203942	. . CYLINDER 10.125 PTP LATE STYLE	1	
- 20	1203943	. . CYLINDER 11.250 PTP LATE STYLE	1	
- 20	120394E	. . CYLINDER 13.125 PTP LATE STYLE	1	
- 20	1203941	. . CYLINDER 10.00 PTP LATE STYLE	1	
- 20	1203944	. . CYLINDER 11.500 PTP LATE STYLE	1	
- 20	1203945	. . CYLINDER 12.500 PTP LATE STYLE	1	
- 20	120373E	. . CYLINDER 13.875 PTP LATE STYLE	1	
		MUST BE OBTAINED BY MES ORDER		
- 22	1176934	. RING,RETAINING	2	
- 23	1176935	. ROLLER, PAPER FEELER	1	
- 24	1128530	. ROD, ANCHOR, 11 INCH MACHINES	1	
- 24	1135323	. ROD, ANCHOR, 15 INCH MACHINES	1	
- 25	1128529	. SPRING, ANCHOR ROD	1	
- 26	127454E	. SPRING, EARLY STYLE	1	
- 26	1203785	. SPRING, LATE STYLE-HEX SHAFT	1	
- 27	1272076	. . PIN FEED PLATEN FBH, 11 INCH MACHINES-NOT ILLUSTRATED	1	
- 27	1272078	. . PIN FEED PLATEN FBH, 15 INCH MACHINES-NOT ILLUSTRATED	1	
		MUST BE OBTAINED BY MES ORDER		
- 28	1269449	. SHIM - FOR CONVERTING EARLY MACHINES TO HEXAGONAL	2	
		SHAFT CYLINDERS (NOT ILLUSTRATED)		





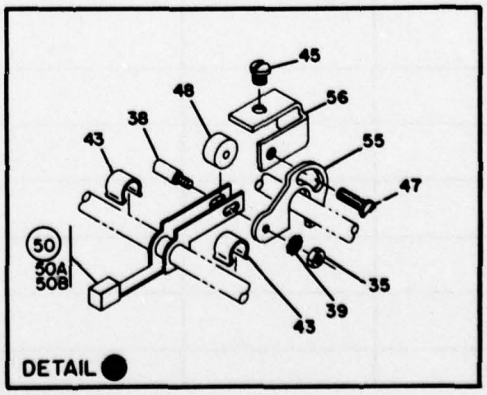


FIGURE 33. 1980 AND 2740-2 D.I. SPLIT PLATEN ASSEMBLY. SEE LIST 33.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		1980 AND 2740-2 D.I. SPLIT PLATEN ASSEMBLY		
33 -	NO NO.	PLATEN GRP-SPLIT 15 IN. 3-6 LPI USED ONLY ON MACHINES 1980 AND 2740-2 DOC. INSERT. SEE FIGURE 33 FOR ILLUSTRATION	NP	
- 1	1135377	. KNOB,PLATEN-GRAY	2	
- 2	1175107	. SETSCREW	4	
- 3	1187289	. PLATEN ASM-SPLIT 15 IN. 3-6 LPI	1	
- 4	236571	. . RING,RETAINING	1	
- 5	257961	. . SETSCREW-SPLINE DR CUP PT 4-40 X 1/4 LG	2	
- 6	1128523	. . BUSHING	1	
- 7	1128524	. . COLLAR, LOCK	1	
- 8	1128527	. . RATCHET	1	
- 9	1175101	. . SETSCREW-6 FLUTE DR 4-40 X 1/8 CUP PT	3	
- 10	1187309	. . SHAFT-SPLIT PLATEN	1	
- 11	118732C	. . PLATEN ASSEMBLY-LH	1	
- 15	1187321	. . PLATEN ASSEMBLY-RH	1	
- 19	1187324	. . GUIDE-SPLIT PLATEN	1	
- 20	1187325	. . PUSH ROD-SPLIT PLATEN LH	1	
- 21	1187326	. . PUSH ROD-SPLIT PLATEN RH	1	
- 22	1187327	. . PIN-CLUTCH POSITION	3	
- 23	1187328	. . ACTUATOR-SW SPLIT PLATEN	1	
- 24	1187329	. . BUSHING-SPLIT PLATEN LH	1	
- 25	1187331	. . DRIVER-SPLIT PLATEN LH	1	
- 26	1187332	. . BRAKE-SPLIT PLATEN LH	1	
- 27	1187333	. . STUD-GUIDE SPLIT PLATEN	2	
- 28	1187334	. . SPRING-SPLIT PLATEN DETENT	1	
- 29	1187335	. . DRIVER-SPLIT PLATEN	2	
- 30	1187336	. . CLIP,RETAINING	1	
- 31	1187337	. . SPRING-COMPRESSION RH SP	1	
- 32	1187338	. . SPRING-COMPRESSION LH BRAKE	1	
- 33	1187339	. . SPRING-COMPRESSION LH PUSH ROD	1	
- 34	1187490	. . BEARING-THRUST SP	1	
- 35	37913	. NUT-HEX 4-40 X .250 ID	1	
- 36	56722	. LOCKWASHER-EXT. TCOTH OD. .150XID. .320	2	
- 37	26320	. CLAMP	1	
- 38	316542	. STUD-PIVOT	1	
- 39	338169	. WASHER,LOCK-EXT TEETH NO. 4 X .260 OD	1	
- 40	355343	. SWITCH-PRECISION SPDT	1	
- 41	438542	. SCREW,MACH-BIND HD 2-56 X 1/2 LG	2	
- 42	438550	. SCREW,MACH-BIND HD 4-40 X 1/2 LG	2	
- 43	1133593	. CLIP	2	
- 44	1135868	. INSULATOR-INDICATOR SWITCH	1	
- 45	1164489	. SCREW-ARM MOUNTING	1	
- 46	1164576	. SCREW	1	
- 47	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 48	116676 3	. WASHER	1	
- 49	1187245	. BRACKET-SWITCH MTG SPLIT PLATEN	1	
- 50	1187314	. ARM ASSEMBLY-JOURNAL BRAKE DRIVEN	1	
- 50A	1187312	. . ARM-JOURNAL BRAKE	1	
- 50B	1187313	. PAD-JOURNAL BRAKE	1	
- 52	1187315	. BRACKET-STANDOFF SWITCH MTG	2	
- 53	1187340	. PLATE-SWITCH MTG	1	
- 54	1187341	. ACTUATOR-ROLLER LEAF SPLIT PLATEN	1	
- 55	1187349	. ARM-JOURNAL BREAK DRIVING	1	
- 56	1187350	. ANCHOR-JOURNAL STOP ACTUATOR	1	
- 57	1090622	. WASHER,FLAT	2	

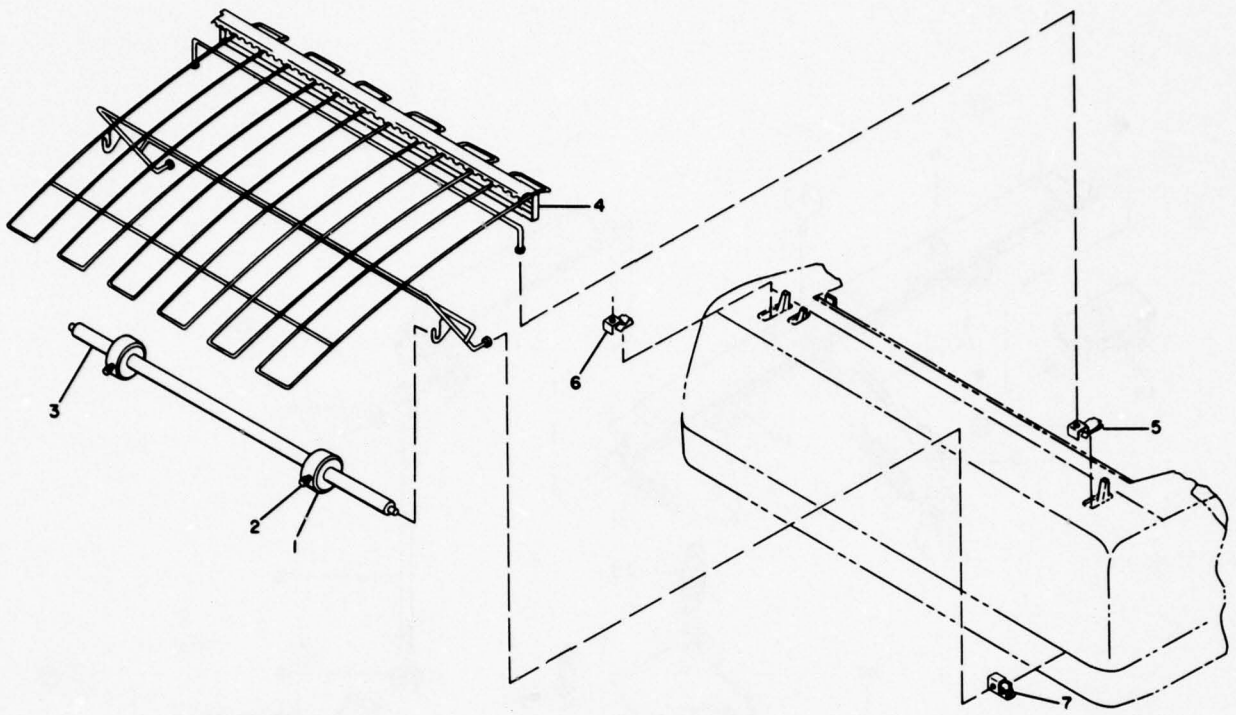


FIGURE 34. 2740 AND 2741 ROLL PAPER GUIDE ASSEMBLY. SEE LIST 34.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4		UNITS PER ASM.	USABLE ON CODE
		2740 AND 2741 ROLL PAPER GUIDE ASSEMBLY			
34 -	1186101	ROLL PAPER GUIDE ASSEMBLY USED ONLY ON MACHINES 2740 AND 2741 SEE FIGURE 34 FOR ILLUSTRATION		REF	
- 1	1186027	. COLLAR-PAPER GUIDE SHAFT		2	
- 2	1186026	. SCREW-SPECIAL PAPER GUIDE SHAFT COLLAR	ATT PT	2	
- 3	1186028	. SHAFT-PAPER GUIDE		1	
- 4	1186025	. GUIDE-ROLL PAPER		1	
- 5	1186031	. SUPPORT-TOP LH PAPER HOLDER	ATT PT	1	
- 6	1186029	. SUPPORT-TOP RH PAPER HOLDER	ATT PT	1	
- 7	1186030	. SUPPORT-REAR PAPER HOLDER	ATT PT	2	

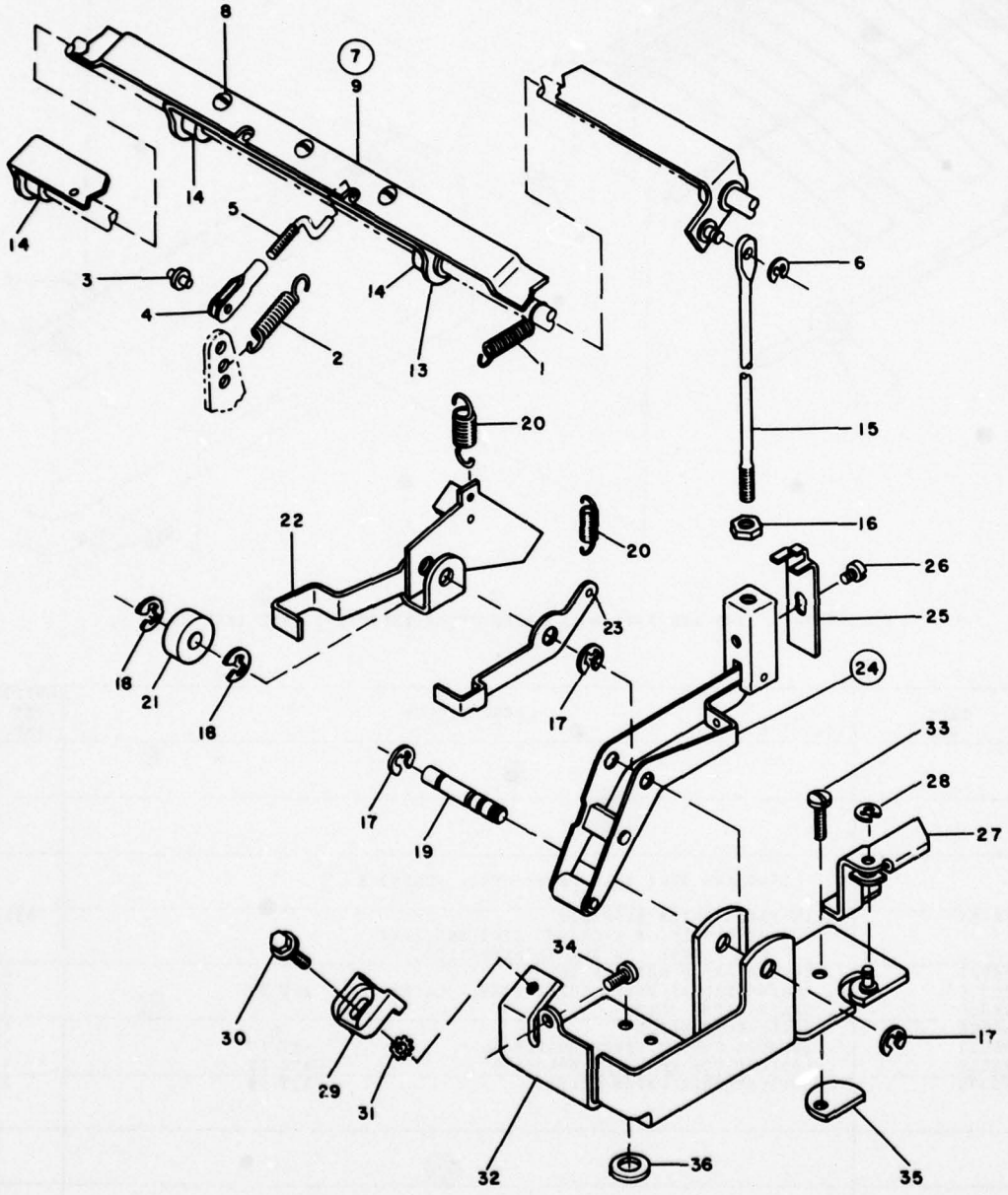


FIGURE 35. 1980 AND 2740-2 D.I. FEED RCLL LOWERING MECHANISH. SEE LIST 35.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		1980 AND 2740-2 D.I. FEED ROLL LOWERING MECHANISM		
35 -	NO NO.	FEED RCIL LCWERING MECHANISM-1980 AND 2740-2 DOC. INSERTION SEE FIGURE 35 FOR ILLUSTRATION	NP	
- 1	1145202	. SPRING,HELICAL,EXTENSION	4	
- 2	1187462	. SPRING-FR TENSICN	4	
- 3	1187845	. STUD-CLEVIS INSERT	4	
- 4	1100928	. CLEVIS-ADJUSTABLE	4	
- 5	1187415	. LINK-CCNNECTING	4	
- 6	25282	. RING-RETAINING,EXT 0.125 ID X 0.015 THK	1	
- 7	1187378	. ARM ASM-FR TENSION	1	
- 8	1164576	. . SCREW	3	
- 9	118738C	. . ARM ASM-FR TENSICN RH	1	
- 13	1187383	. . ARM-FR SPRING TENSION LH	1	
- 14	1166188	. WICK-CIL	4	
- 15	1164047	. LINK- 11 IN. HEAVY	1	
- 16	1133619	. NUT, ROTATE ARM ICCK ATT PT	1	
- 17	1132122	. RETAINER	2	
- 18	1092125	. RING-RETAINING	2	
- 19	1187367	. SHAFT-FR CAM FOLLOWER	1	
- 20	71296	. SPRING,HELICAL,EXTENSION 18.5 TURNS	2	
- 21	1166770	. WICK-OIL	1	
- 22	1187364	. LATCH ASM-CLUTCH STOP	1	
- 23	1187366	. LATCH-FR CAM CHECK	1	
- 24	1187356	. FOLLOWER ASM-FR CAM	1	
- 25	1187833	. . STOP-FR ARM RELEASE	1	
- 26	1091817	. . SCREW,MACH-FLAT FIL H 6-40 X 5/32 LG ATT PT	1	
- 27	1187354	. ARM-FR LATCH	1	
- 28	1073418	. RING-RETAINING ATT PT	1	
- 29	1159843	. SUPPORT-CAM SHAFT BUSHING	1	
- 30	1145543	. SCREW ASSEMBLY-HEX HD 6-32 X 7/16 LG ATT PT	1	
- 31	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320 ATT PT	1	
- 32	1187351	. BRACKET ASM FR CAM MTG	1	
- 33	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG ATT PT	1	
- 34	35739	. SCREW,MACH-BIND HD 6-32 X 15/16 LG ATT PT	2	
- 35	1187257	. SPACER-BRACKET MTG REAR	1	
- 36	1187258	. SPACER-LATCH MTG BRACKET	2	

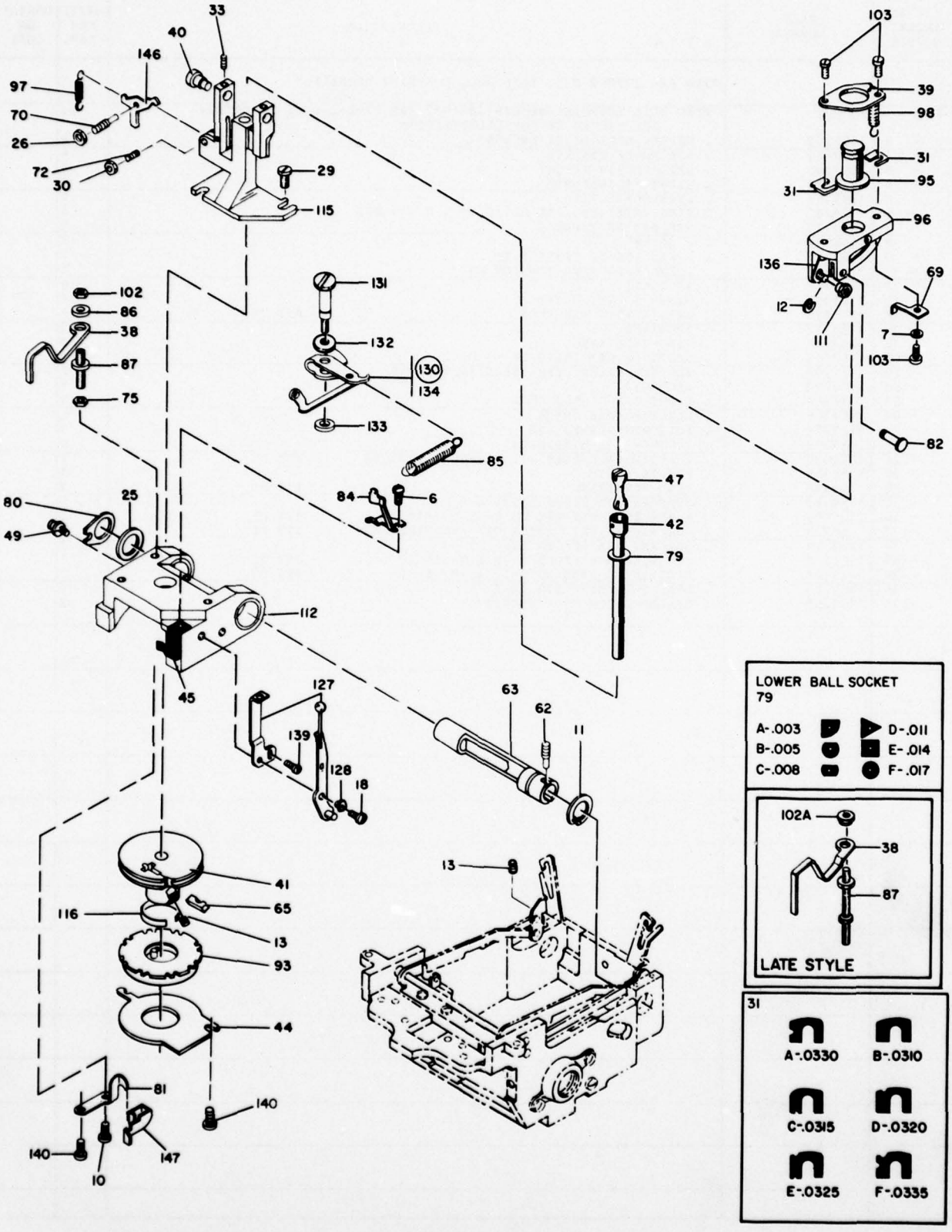


FIGURE 36. CARRIER AND ROCKER ASSEMBLIES. SHEET 1 OF 2. SEE LIST 36.

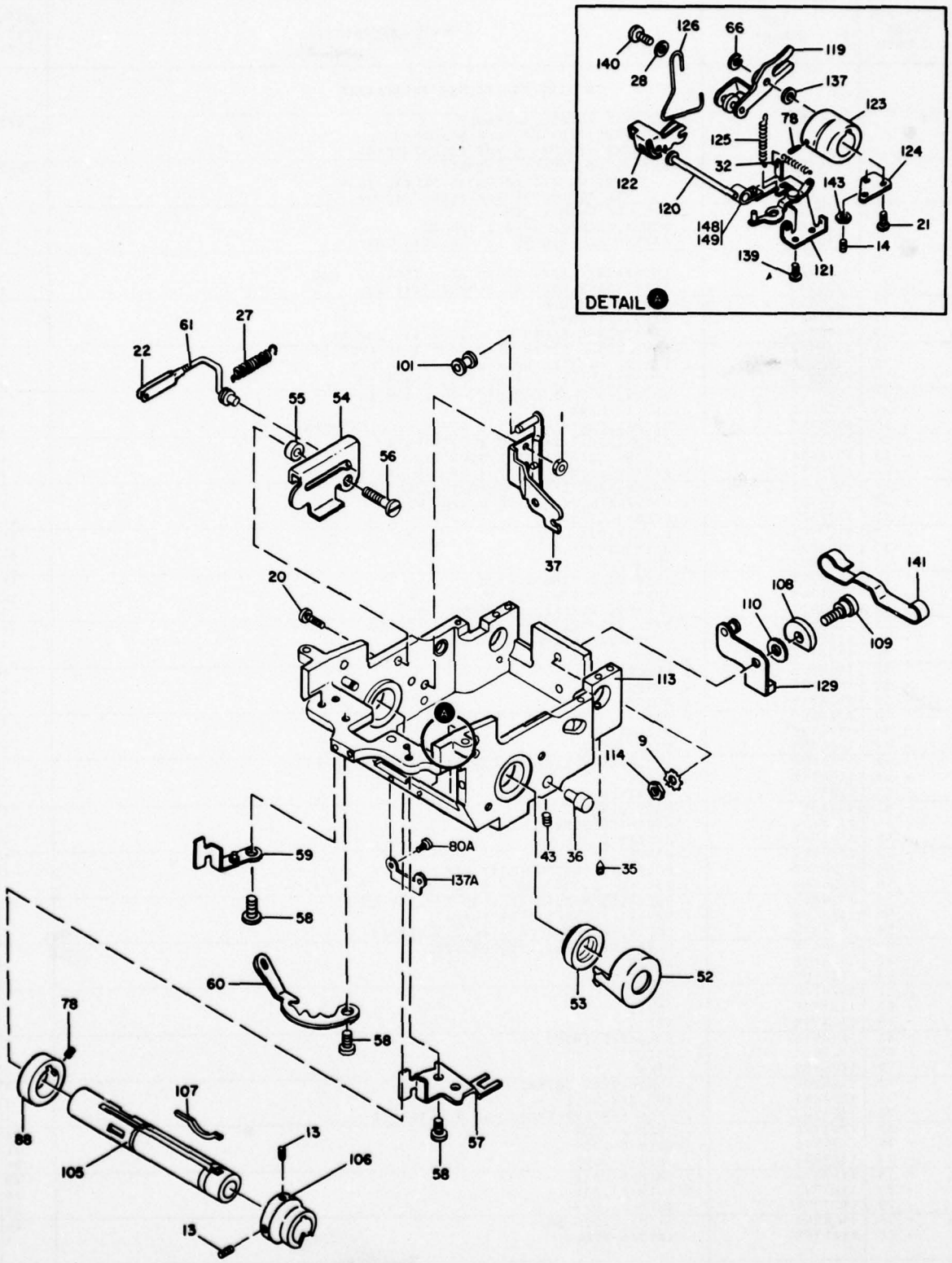


FIGURE 36. CARRIER AND ROCKER ASSEMBLIES. SHEET 2 OF 2. SEE LIST 36.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		CARRIER AND ROCKER ASSEMBLIES		
36 -	1159908	CARRIER & ROCKER ASSEMBLY USED ONLY ON MACHINES 1518 SEE FIGURE 36 FOR ILLUSTRATION	REF	
-	1176804	CARRIER AND ROCKER ASSEMBLY USED ON ALL MACHINES EXCEPT 1518 SEE FIGURE 36 FOR ILLUSTRATION	REF	
- 1	37913	. NUT-HEX 4-40 X .250 ID	2	
- 6	38565	. SCREW,MACH-RH 4-40 X 1/4 LG	1	
- 7	45611	. WASHER,FL- 0.0879 ID X 0.0179 THK	1	
- 9	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	1	
- 10	186712	. SCREW,MACH-BIND HD 3-48 X 3/16 LG	1	
- 11	236571	. RING,RETAINING	1	
- 12	251989	. RING,RETAINING	1	
- 13	1175101	. SETSCREW-6 FLUTE DR 4-40 X 1/8 CUP PT	4	
- 14	1175102	. SETSCREW-6 FLUTE DR 4-40 X 3/16 FLAT PT	1	
- 18	338238	. SCREW, MACH-BD HD 4-40 NC X .3125 LG	1	
- 20	472729	. SCREW,MACH-FL CSK HD 4-40 X 3/8 LG	2	
- 21	472729	. SCREW,MACH-FL CSK HD 4-40 X 3/8 LG	2	
- 22	1070020	. CLEVIS-LINK	1	
- 25	1078497	. WASHER,FLAT- 0.377 ID 0.594 OD 0.010 THK	1	
- 26	109026E	. NUT,PLAIN,HEX- 3-48 X 3/16 FL W	1	
- 27	1090404	. SPRING,HELICAL,EXTENSION	1	
- 28	1090657	. WASHER,FL-NO. 5 X 1/4 OD X 0.014 THK	1	
- 29	112358E	. SCREW,MACH-HEX HD 4-40 X 0.260 LG	2	
- 30	112378S	. NUT,PLAIN,HEX- 2-56 X 3/64 FL W	1	
- 31	1123822	. SHIM-A.0330	AR	
- 31	1123823	. SHIM-B.0310	AR	
- 31	1123824	. SHIM-C.0315	AR	
- 31	1123825	. SHIM-D.0320	AR	
- 31	1128281	. SHIM-TILT RING-E.0325	AR	
- 31	1141144	. SHIM-TILT RING-F.0335	AR	
- 32	1123827	. SPRING,HELICAL,EXTENSION	1	
- 33	1123828	. SETSCREW-HEADLESS 3-48 X 0.130 LG	2	
- 35	1175803	. SETSCREW-ROCKER STOP	1	
- 36	1124176	. STUD	1	
- 37	1164153	. BRACKET	1	
- 38	112845E	. LEVER	1	
- 39	112418E	. SPACER	1	
- 40	1124190	. PIN- 0.1555 OD X 1/4 LG	1	
- 41	1124196	. PULLEY	1	
- 42	1164550	. BALL-SOCKET	1	
- 43	1175104	. SETSCREW-SPLINE DR CUP PT 4-40 X 3/16 LG	1	
- 44	116454E	. PLATE	1	
- 45	120386J	. RETAINER	1	
- 47	112422C	. BALL JOINT	1	
- 49	1124234	. STUD-ECCENTRIC	1	
- 52	114150E	. RETAINER	1	
- 53	1124647	. WIPER	1	
- 54	1124663	. FOLLOWER, RIBBON LIFT CAM	1	
- 55	1124664	. SPACER- 0.114 DIA X 0.062 THK	1	
- 56	1124665	. SCREW,MACH-SLTD HD 4-40 X 0.307 LG	1	
- 57	112466E	. LEVER, FRONT RIBBON LOAD	1	
- 58	1124672	. SCREW,MACH-HEX HD 4-40 X 0.299 LG	3	
- 59	1124674	. LEVER ASSEMBLY, RIBBON LIFT	1	
- 60	1124678	. LEVER	1	
- 61	112468C	. LINK	1	
- 62	1124707	. SCREW	1	
- 63	112470E	. SHAFT	1	
- 65	1124745	. KEY	1	
- 66	107341E	. RING-RETAINING	2	
- 69	1124831	. GUIDE	1	
- 70	1123889	. STUD	1	
- 72	112483E	. SCREW-TILT DETENT GUIDE	1	
- 75	1134842	. NUT,HEX NO.6	1	
- 78	1127760	. SETSCREW-HEADLESS 6-32 X 0.141 LG	1	
- 79	1141176	. SHIM-A .003	AR	
- 79	1127770	. SHIM-B .005	AR	
- 79	1127771	. SHIM-C .008	AR	
- 79	1127772	. SHIM-D .011	AR	
- 79	1127773	. SHIM-E .014	AR	
- 79	1127774	. SHIM-F .017	AR	
- 79	1164563	. SHIM- 0.025 IN.	AR	
- 80	1141189	. WASHER-NYLON	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
36 - 80A	1124827	. SCREW,MACH-HEX HD 4-40 X 13/64 LG	2	
- 81	1164044	. GUIDE,TAPE	1	
- 82	NO NO.	. STUD-TILT LINK,REF. CNLY-ORDER INDEX 96	NP	
- 84	1141625	. BRACKET-TILT SPRING	1	
- 85	1128459	. SPRING-TILT PULLEY	1	
- 86	1128493	. WASHER	1	
- 87	1128495	. SCREW-DBL END HEX CENTER 6-32 THD EA END	1	
- 88	1159507	. CAM-RIBBON LIFT	1	
- 93	1203862	. CAGE-SPRING	1	
- 95	1141997	. SOCKET-UPPER BALL	1	
- 96	1164039	. RING,TILT	1	
- 97	1133658	. SPRING,HELICAL,EXTENSION	1	
- 98	1133659	. SPRING,HELICAL,EXTENSION	1	
-101	1134803	. ROLLER	1	
-102	1134842	. NUT,HEX NO.6	1	
-102A	1175352	. NUT-LATE STYLE	1	
-103	1138353	. SCREW	3	
-105	1166102	. SLEEVE-PRINT SHAFT	1	
-106	1164240	. CAM-RIBBON FEED AND DETENT	1	
-107	1141151	. KEY, PRINT SLEEVE	1	
-108	1141770	. SHOE,UPPER	1	
-109	1141772	. STUD-SHOE ECCENTRIC	1	
-110	1164218	. WASHER,FLAT- 0.143 ID 0.327 OD 0.040 THK	1	
-111	1141182	. NUT,SELF LOCKING- 2-64 X 0.153 WIDE HEX	1	
-112	1141752	. ROCKER	1	
-113	1141200	. CARRIER ASSEMBLY	1	
-114	38051	. NUT-FRICTION LATCH MOUNTING	1	
-115	1141235	. YOKE ASSEMBLY	1	
-116	1141238	. CLIP, ROTATE PULLEY	1	
-119	1141619	. FOLLOWER	1	
-120	1141622	. STUD	1	
-121	1141624	. BRACKET-TAB CORD	1	
-122	1141626	. YOKE	1	
-123	1141627	. CAM-PRINT	1	
-123	1176826	. CAM-PRINT USED ON ALL MACHINES EXCEPT 1518	1	
-124	1141629	. STOP-ROCKER	1	
-125	1141630	. SPRING-ROCKER RETURN	1	
-125	1176827	. SPRING-ROCKER RETURN USED ON ALL MACHINES EXCEPT 1518	1	
-126	1141637	. GUIDE-CABLE	1	
-127	1141757	. LEVER ASSEMBLY	1	
-128	1141759	. ECCENTRIC-VELOCITY CONTROL	1	
-129	1147260	. SHOE ASSEMBLY-LOWER	1	
-130	1280498	. TILT BELLCRANK ASSEMBLY	1	
-131	1175197	. . STUD-TILT PULLEY	1	
-132	1164099	. . RETAINOR-TILT PULLEY	1	
-133	1164158	. . SPACER-LH	1	
-134	1174427	. . PULLEY-TILT	1	
-136	1164285	. LEVER-ROTATE DETENT	1	
-137	1164290	. WASHER,FLAT- 0.130 ID 0.240 OD 0.020 THK	1	
-137A	1164435	. PAD-BEARING	1	
-139	1164580	. SCREW,MACH-BINDING HD 4-40 X 0.250 LG	5	
-140	1164582	. SCREW	1	
-141	1166164	. SPRING-UPPER SHOE	1	
-143	2114985	. NUT,SELF LKG HEX 4-40 X .062 THK	1	
-145	1272176	. DETENT SUPPORT ASSEMBLY NOT ILLUSTRATED	1	
-146	1164151	. LEVER-TILT DETENT	1	
-147	1174011	. GUARD,TAPE	1	
-148	1141636	. CABLE CLAMP	1	
-149	1141771	. SCREW	1	

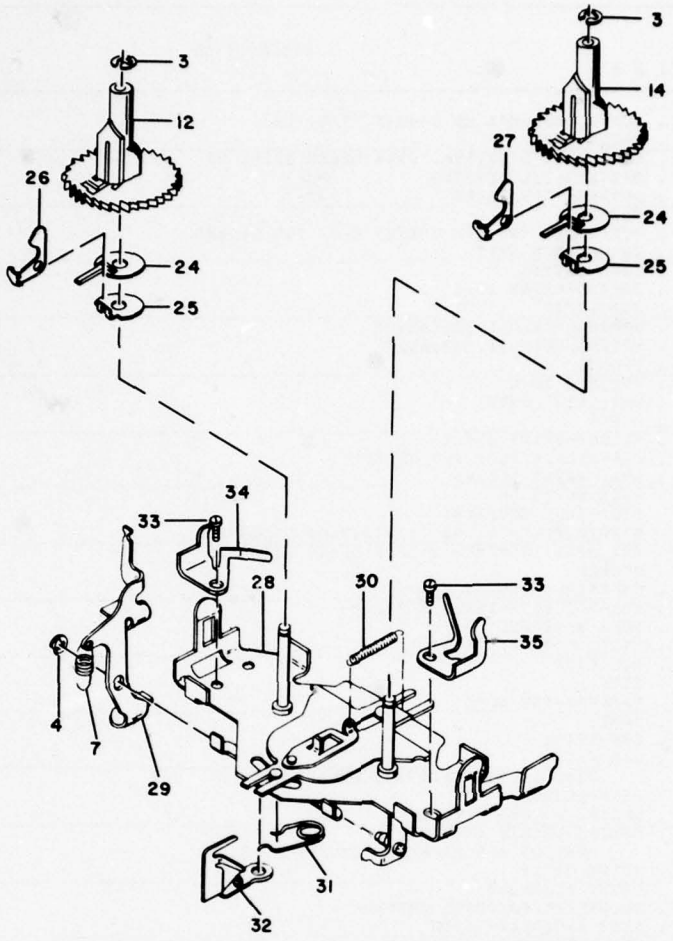


FIGURE 37. RIBBON FEED ASSEMBLY. SEE LIST 37.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		RIBBON FEED ASSEMBLY		
37 -	1164600	RIBBON FEED ASSEMBLY-LATE STYLE SEE FIGURE 37 FOR ILLUSTRATION	REF	
- 3	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	2	
- 4	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	1	
- 7	1164555	. SPRING,HELICAL,EXTENSION	1	
- 12	1175132	. RATCHET, LH	1	
- 14	1175133	. RATCHET, RH	1	
- 24	1141800	. SPRING-TRIGGER	2	
- 25	1141801	. BRACKET-TRIGGER	2	
- 26	1141878	. TRIGGER-LH REV	1	
- 27	1141889	. TRIGGER-RH REV	1	
- 28	1164220	. PLATE-RIBBON FEED	1	
- 29	116423E	. LEVER-RIBBON FEED	1	
- 30	1164239	. SPRING-FEED PAWL	1	
- 31	1164237	. SPRING-DETENT LEVER	1	
- 32	1164241	. LEVER	1	
- 33	1164580	SCREW,MACH-BINDING HD 4-40 X 0.250 LG	4	
- 34	1128403	SPRING-LH	1	
- 35	1128404	SPRING-RH	1	

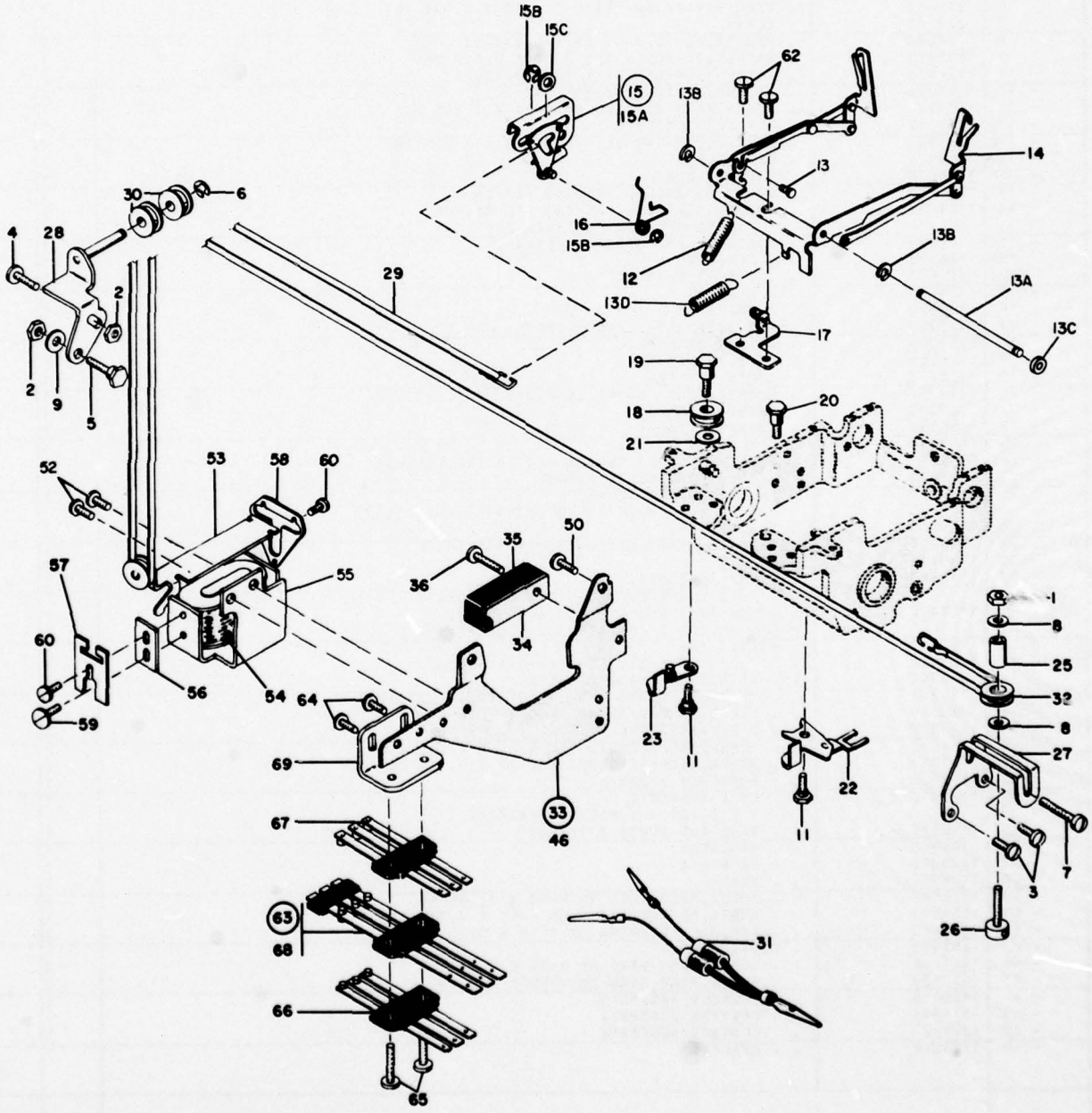
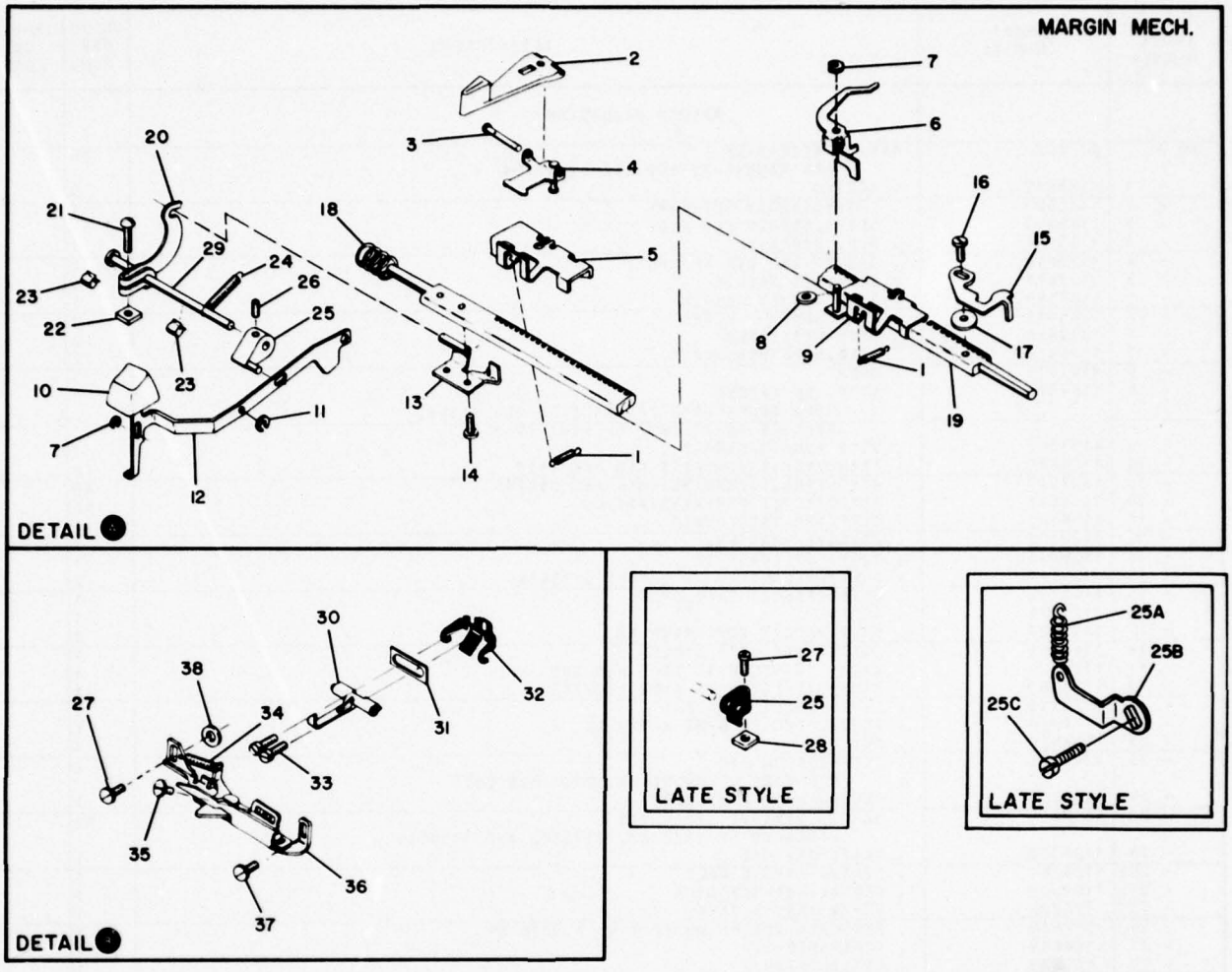


FIGURE 38. RED RIBBON SHIFT MECHANISM ASSEMBLY. SEE LIST 38.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		RED RIBBON SHIFT MECHANISM ASSEMBLY		
38 -	1272007	RED RIBBON SHIFT MECHANISM ASM-FBM 1 MAG SEE FIGURE 38 FOR ILLUSTRATION	REF	
- 1	37913	. NUT-HEX 4-40 X .250 ID	1	
- 2	38051	. NUT-FRICTION LATCH MOUNTING	2	
- 3	236550	. SCREW,MACH-BIND HD 4-40 X 0.375 LG	2	
- 4	38352	. SCREW,MACH-FIL H 6-32 X 3/8 LG	1	
- 5	38352	. SCREW,MACH-FIL H 6-32 X 3/8 LG	1	
- 6	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	1	
- 7	333182	. SCREW	1	
- 8	263680	. WASHER,FL- 0.1305 ID X 0.032 THK	1	
- 9	1090970	. WASHER,FL-NO. 6 X 3/8 OD X 0.020 THK	1	
- 11	1124672	. SCREW,MACH-HEX HD 4-40 X 0.299 LG	2	
- 12	1091073	. SPRING,HELICAL,EXTENSION	1	
- 13	116457E	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 13A	1124662	. ROD-FULCRUM LIFT	1	
- 13B	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	2	
- 13C	1187004	. OIL-WICK	2	
- 13D	1100936	. SPRING,LOCK	1	
- 14	1128719	. GUIDE ASSEMBLY,LINK AND RIBBON	1	
- 14	1124659	. GUIDE ASSEMBLY-LINK AND RED RIBBON USED ONLY ON MACHINES 1980	1	
- 15	1128721	. FOLLOWER AND SPRING ASSEMBLY	1	
- 15A	1128723	. . FOLLOWER	1	
- 15B	219633	. . RING-RETAINING	2	
- 15C	1124664	. . SPACER	1	
- 16	1128722	. . SPRING-TORSION	1	
- 17	1128727	. ARM ASSEMBLY-RIBBON LIFT	1	
- 18	1159004	. PULLEY-CARRIER	1	
- 19	1159009	. STUD,PULLEY-NEW	1	
- 20	1128733	. SCREW-SPECIAL	1	
- 21	113879E	. WASHER,FLAT- 0.113 ID 0.328 OD 0.020 THK	1	
- 22	112873E	. LEVER ASSEMBLY	1	
- 23	1128738	. LEVER ASSEMBLY	1	
- 25	1159016	. SPACER	1	
- 26	115901C	. SCREW-HD CROSS TAPPED 4-40,0.580 LG 4-40	1	
- 27	1159027	. BRACKET-RH PULLEY PIVOT	1	
- 27	115981C	. BRACKET-RR SHIFT RH USED ON MACH ABOVE 4684503 AND 4634670	1	
- 28	1159007	. BRACKET-LH	1	
- 29	1159026	. TAPE ASSEMBLY-RIBBON SHIFT MECHANISM	1	
- 30	1159017	. PULLEY	2	
- 31	1135643	. DIODE ASSEMBLY ASSEMBLY CONTAINS COMMON ANODE	1	
- 31	1159420	. DIODE ASSEMBLY-COMMON CATHODE ASSEMBLY CONTAINS COMMON CATHODE	1	
- 32	1159015	. PULLEY-RH	1	
- 33	1159024	. RED RIBBON SHIFT ASSEMBLY- 1 MAGNET	1	
- 34	317766	. . INSULATOR-TERMINAL BLOCK	1	
- 35	317767	. . TERMINAL BOARD ASM- 12 FEEDTHRU TERMINAL	1	
- 36	438549	. . SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
- 46	1128993	. . PLATE-MOUNTING	1	
- 50	1164580	. . SCREW,MACH-BINDING HD 4-40 X 0.250 LG	2	
- 52	1117759	. . SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 53	1159023	. . ARMATURE ASSEMBLY	1	
- 54	1128910	. . COIL ASSEMBLY USED ON 48V MAGNET ASSEMBLY	1	
- 55	1128919	. . YOKE AND COVER ASSEMBLY	1	
- 56	112896E	. . RESIDUAL	1	
- 57	1128966	. . BACKSTOP	1	
- 58	1128967	. . PLATE	1	
- 59	113206E	. . SCREW,MACH-SLTD HD 4-40 X 0.109 LG	1	
- 60	1164578	. . SCREW,MACH-BINDING HD 4-40 X 0.125 LG	2	
- 62	1164580	. SCREW,MACH-BINDING HD 4-40 X 0.250 LG	2	
- 63	1262785	. CONTACT ASM	1	
- 64	341216	. . SCREW,MACH-BIND HD 4-40 X 0.187 LG	2	
- 65	438550	. . SCREW,MACH-BIND HD 4-40 X 1/2 LG	2	
- 66	1128908	. . CONTACT ASSEMBLY	1	
- 67	1128909	. . CONTACT ASSEMBLY	1	
- 68	1128924	. . CONTACT ASSEMBLY	1	
- 69	1128994	. . BRACKET	1	



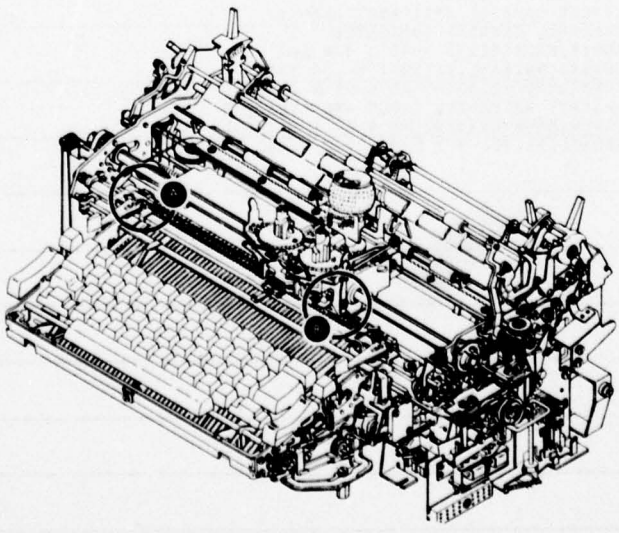


FIGURE 39. MARGIN MECHANISM. SEE LIST 39.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		MARGIN MECHANISM		
39 -	NO NO.	MARGIN MECHANISM SEE FIGURE 39 FOR ILLUSTRATION	NP	
- 1	1123812	. SPRING	2	
- 2	1135083	. LEVER,MARGIN SET-GRAY	1	
- 2	1159352	. LEVER,MARGIN SET-BLUE	1	
- 3	1123611	. PIN, STRAIGHT	1	
- 4	1123610	. SLIDER AND PIN ASSEMBLY	1	
- 5	1123615	. STOP, LH MARGIN	9	
- 5	1187599	. STOP ASM-LH MARGIN	1	
- 6	1141474	. BELICRANK- 1 PIECE	1	
- 7	1073418	. RING-RETAINING	2	
- 7	1125066	. CLIP,RETAINER,BOWED	2	
- 8	1141175	. SHIM	1	
- 9	1187599	. STOP, RH MARGIN WHEN INSTALLING IN PLACE OF OLD STYLE, REPLACE PN 1133607 OR 1141474 ALSO	1	
- 9	1187668	. STOP ASM-RH MARGIN	1	
- 10	1124845	. KEYBUTTON,TYPEWRITER-MAR REL GRAY	AR	
- 10	1127924	. KEYBUTTON,TYPEWRITER-MAR REL SYMBOL	AR	
- 10	1164676	. KEYBUTTON,TYPEWRITER-ALT CO	AR	
- 11	1159205	. CLIP,RETAINER,BOWED	1	
- 12	1128323	. KEYLEVER-MAR REL	1	
- 13	1128316	. STOP-SET LEVER LH	1	
- 14	108114	. SCREW,MACH-BIND HD 4-40 X 0.156 LG	2	
- 15	1141232	. GUIDE-MARGIN RACK OVER	1	
- 16	1164576	. SCREW	1	
- 17	1141227	. STOP-MARGIN SET LEVER RH	1	
- 18	1145446	. SPRING-MAR RACK RETURN	1	
- 19	1128305	. RACK- 10 PITCH 15 INCH MACHINE	1	
- 19	1128307	. RACK- 12 PITCH 15 INCH MACHINE	1	
- 20	1128318	. LEVER-MARGIN RELEASE	1	
- 21	1928	. SCREW,MACH-RH 6-32 X 1/2 LG	1	
- 22	1134829	. NUT	1	
- 23	1141223	. CLIP-TORQUE BAR NOT USED ON MACHINES 1980 AND 2970	2	
- 24	1115057	. SPRING-MARGIN RELEASE	1	
- 25	NO NO.	. MARGIN RELEASE- OBSOLETE REPLACED BY 1128322, 1175102 AND 1164619	NP	
- 25	1128322	. CLAMP-MAR REL	1	
- 25A	1124240	. SPRING-MARGIN RACK	1	
- 25B	1109028	. BRACKET-MARGIN RACK	1	
- 25C	170225	. SCREW-MARGIN RACK	1	
- 26	257956	. SETSCREW-SPLINE DR FP 4-40 X 3/16 LG	1	
- 27	1164619	. SCREW-MAR REL	1	
- 28	602229	. NUT,LOCKING	1	
- 29	1128066	. SHAFT-MAR REL	1	
- 30	1135084	. INDICATOR, CARRIER	1	
- 31	1134888	. SPACER-CARRIER INDICATOR BRACKET	1	
- 32	1124702	. BRACKET, CARRIER INDICATOR	1	
- 33	38262	. SCREW,MACH-FIL H 4-40 X 1/4 LG	2	
- 34	123552	. SPRING,HELICAL,EXTENSION- 21 TURNS	1	
- 35	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 36	1123640	. BRACKET ASSEMBLY, LATCH AND LINELOCK		
- 37	1164580	. SCREW,MACH-BINDING HD 4-40 X 0.250 LG	2	
- 38	45639	. WASHER,FL-NO. 4 X 5/16 OD X 0.020 THK	1	

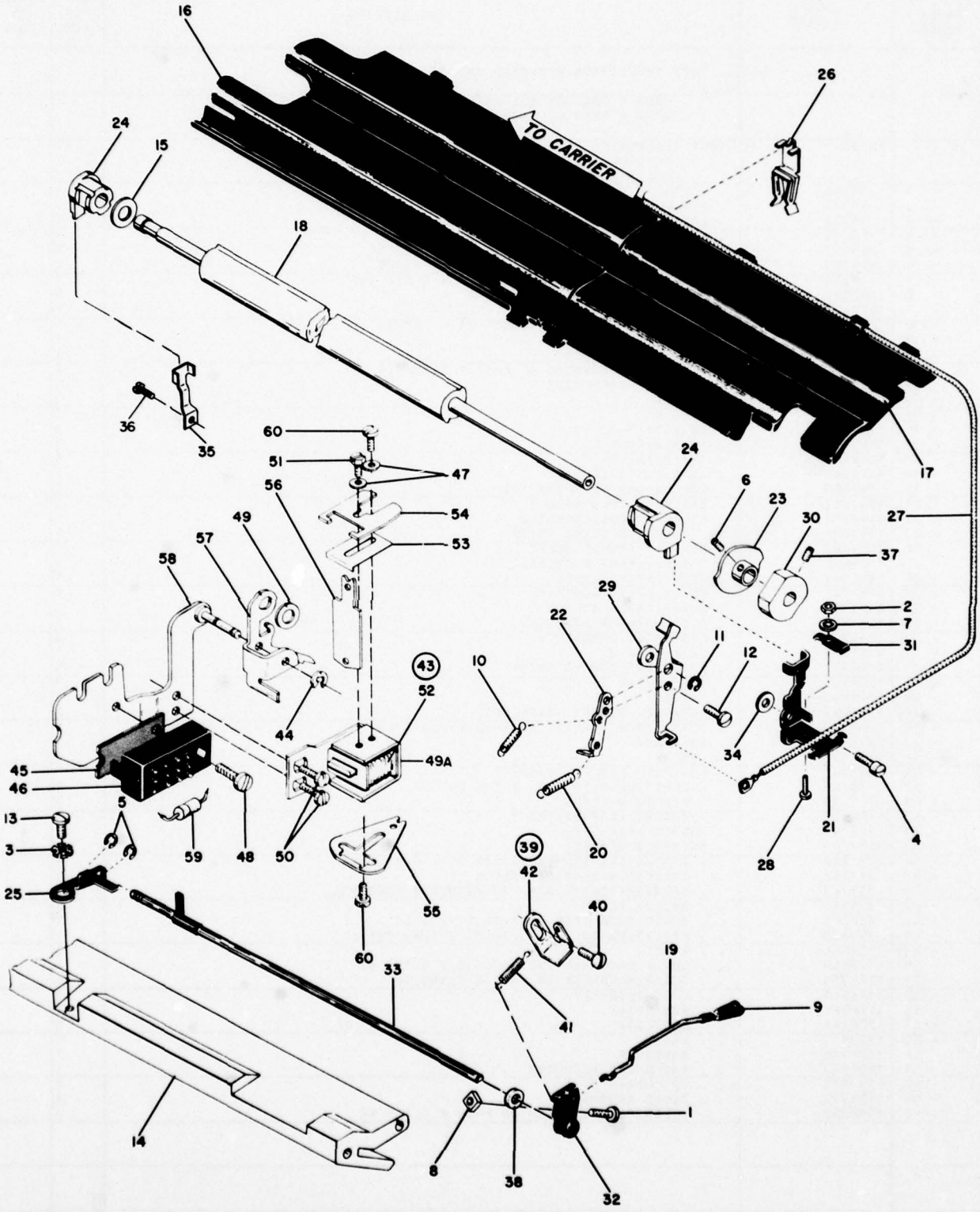


FIGURE 40. DUAL IMPRESSION KEYBOARD SELECTION ASSEMBLY. SEE LIST 40.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		DUAL IMPRESSION KEYBOARD SELECTION ASSEMBLY		
		CODE A USED ON ALL MACH. BUT 1518 & 1980 CODE B USED ON MACHINE 1980 ONLY		
40 -	NO NO.	DUAL IMPRESSICN KEYBOARD SELECTION ASM USED ON ALL MACHINES EXCEPT 1518 SEE FIGURE 40 FOR ILLUSTRATION	NP	
- 1	38566	. SCREW	1	
- 2	47987	. NUT,PLAIN,HEX- 2-56 X 3/16 FL W	1	
- 3	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	1	
- 4	170215	. SCREW,ASMD WASHER-FIL H 6-32 X 3/8 LG	1	
- 5	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	2	
- 6	1175101	. SETSCREW-6 FLUTE DR 4-40 X 1/8 CUP PT	2	
- 7	358509	. WASHER,IK INT TOOTH 0.092 ID X 0.012 THK	1	
- 8	1142264	. NUT-ECCENTRIC STUD MCUNTING	1	
- 9	1070020	. CLEVIS-LINK	1	
- 10	1071687	. SPRING,HELICAL,EXTENSION- 21.5 TURNS	1	
- 11	1073418	. RING-RETAINING	1	
- 12	1115735	. SCREW, BRAKE MTG	1	
- 13	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	1	
- 14	1176858	. SUPPORT-COMB GUIDE	1	
- 14	1128895	. SUPPORT	1	
- 15	1128144	. SPACER	1	
- 16	1141649	. SHIELD-LH 15 IN.	1	
- 17	1159936	. SHIELD-DUST RH	1	
- 18	1164760	. SHAFT-FILTER	1	
- 19	1141647	. LINK-LOW VELOCITY	1	
- 20	1141650	. SPRING-LCW VELOCITY FOI	1	
- 21	1141651	. BRACKET-CABLE ANCHOR	1	
- 22	1141652	. STOP-CAM FOLLOWER ADJ	1	
- 23	1141655	. CAM LOW VELOCITY SHIFT	1	
- 24	1141663	. BEARING-FILTER SHAFT	2	
- 25	1141666	. BRACKET-VANE MOUNTING	1	
- 26	1141761	. CLIP-CABLE CENTER	1	
- 27	1141765	. CABLE,DUAL VELOCITY	1	
- 28	1141771	. SCREW,CABLE ANCHOR	1	
- 29	1141780	. FOLLOWER-LOW VELOCITY	1	
- 30	1187205	. CAM-SHIFT INTERLOCK	1	
- 31	1141805	. CLAMP-CABLE	1	
- 32	1141835	. BELLCRANK-LOW VELOCITY	1	
- 33	1176868	. VANE-PRINT NO PRINT	1	
- 34	1141890	. SPACER	1	
- 35	1141895	. RETAINER-FILTER SHAFT BRG	1	
- 36	1164577	. SCREW,MACH-BINDING HD 6-32 X 0.312 LG	1	
- 37	1175107	. SETSCREW	1	
- 38	1164652	. SPACER	1	
- 39	1272709	. LOW VELOCITY BELLCRANK	1	
- 40	38346	. . SCREW,MACH-FH 6-32 X 1/8 LG	1	
- 41	120710	. . SPRING-NP VANE	1	
- 42	1159650	. . BRACKET-LOW VELOCITY	1	
- 43	1159894	. MAGNET ASSEMBLY	1	A
- 43	1187794	. MAGNET ASSEMBLY	1	B
- 44	1073418	. . RING,RETAINING-EXT 0.114 ID X 0.025 THK	1	
- 45	317766	. . INSULATOR-TERMINAL BLCCK	1	
- 46	317767	. . TERMINAL BOARD ASM- 12 FEEDTHRU TERMINAL	1	
- 47	355341	. . WASHER,FLAT	2	
- 48	438549	. . SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
- 49	1090630	. . WASHER,FL-NO. 3 X 5/16 OD X 1/64 THK	1	
- 49A	1128962	. . YOKE	1	
- 50	1117759	. . SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 51	1127785	. . SCREW,MACH-HEX HD 4-4C X 0.156 LG	1	
- 52	1128964	. . COIL ASSEMBLY	1	
- 53	1128965	. . RESIDUAL	1	
- 54	1128966	. . BACKSTOP	1	
- 55	1128967	. . PLATE	1	
- 56	1128969	. . ARMATURE	1	
- 57	1159891	. . LATCH-LOW VELOCITY	1	
- 58	1159893	. . BRACKET-MTG	1	
- 59	1135573	. . DIODE ASSEMBLY	1	
- 60	1164578	. . SCREW,MACH-BINDING HD 4-40 X 0.125 LG	2	

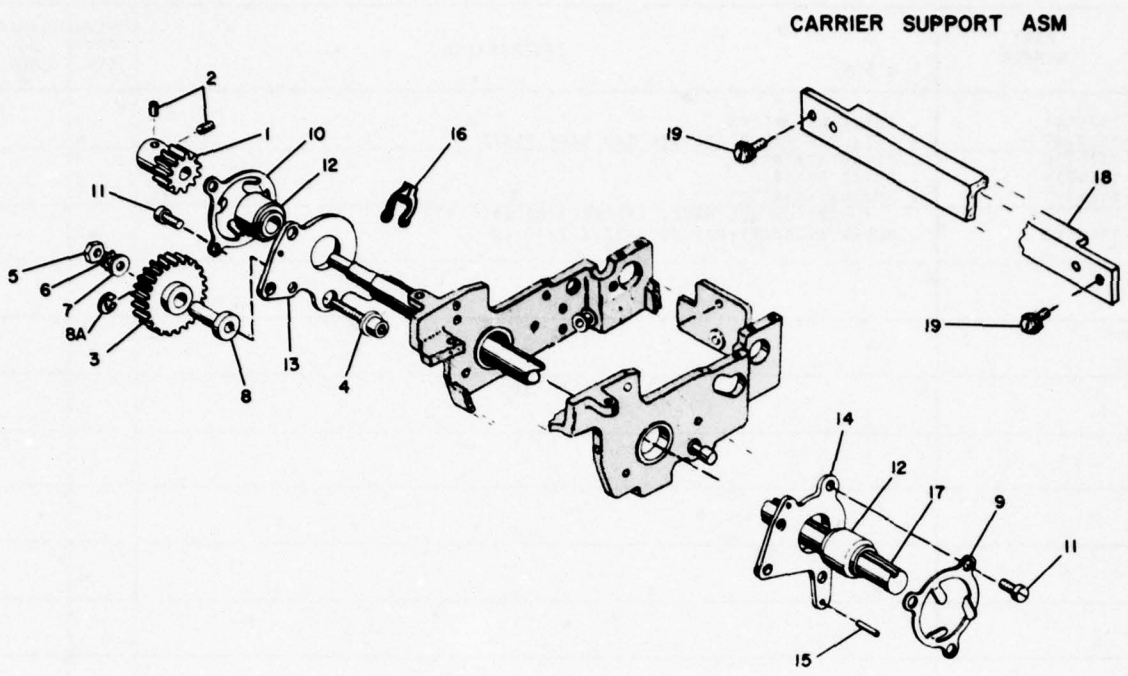
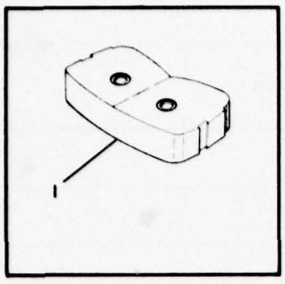
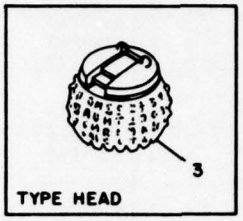


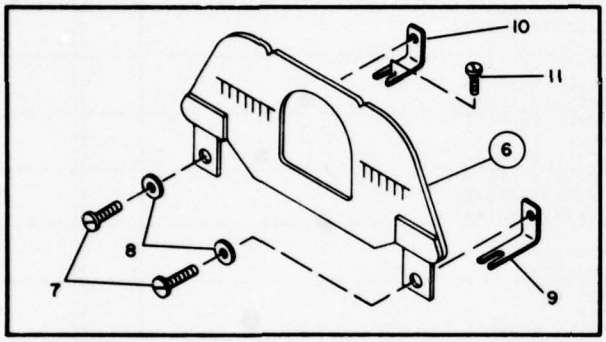
FIGURE 41. CARRIER SUPPORT ASSEMBLY. SEE LIST 41.

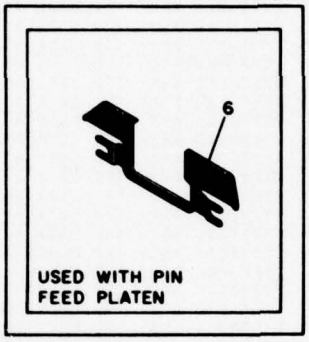
LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		CARRIER SUPPORT ASSEMBLY		
41 -	NO NO.	CARRIER SUPPORT ASSEMBLY	NP	
- 1	1164739	. GEAR-PRINT SHAFT	1	
- 2	1175103	. SETSCREW-6 FLUTE DR 6-32 X 1/8 CUP PT	2	
- 3	1159350	. GEAR ASSEMBLY-UPPER IDLER-EARLY STYLE-1/4" I.I.	1	
- 3	1175865	. GEAR ASM,UPPER IDLER,LATE STYLE-5/16" I.D.	1	
- 4	1134841	. SCREW,CAP,FLTD-SOC HD	1	
		USE WITH INDEX 3 EARLY STYLE		
- 4	1175866	. SCREW,CAP FLTD-SOC HD USED WITH INDEX 3 LATE STYLE	1	
- 5	38051	. NUT-FRICTION LATCH MOUNTING	1	
- 6	56722	. LOCKWASHER-EXT.	1	
- 7	1134843	. WASHER,FL	1	
- 7	1175868	. WASHER,FLAT-USED WITH INDEX 3 LATE STYLE	1	
- 8	1203364	. STUD-USED WITH INDEX 3 LATE STYLE	1	
- 8	1159097	. STUD EARLY STYLE	1	
- 8A	332747	. RING,RETAINER	1	
- 9	1124168	. RETAINER-BEARING RH	1	
- 10	1141749	. RETAINER-BEARING LH	1	
- 11	38350	. SCREW,MACH-FIL H 6-32 X 1/4 LG	3	
- 12	1164740	. BEARING-PRINT SHAFT	2	
- 13	1135590	. PLATE-PS BRG LH	1	
- 13	1187114	. PLATE-PS BRG LH USED ONLY ON MACHINES 1518, 1980 AND 2570 BELOW EC507606	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
41 - 14	1135591	. PLATE-PS BRG RH	1	
- 15	1132212	. PIN, ESC BACKPLATE AND TAB RACK PLATE	4	
- 16	1175220	. RING-RETAINING	1	
- 17	1164738	. PRINT SHAFT	1	
- 18	1164791	. SUPPORT-CARRIER	1	
		USED ON ALL MACH. EXCEPT 1980 AND 2970		
- 19	1145543	. SCREW ASSEMBLY-HEX HD 6-32 X 7/16 LG	2	









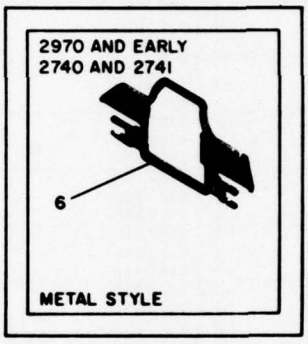


FIGURE 42. TYPEHEAD, CARDHOLDER, AND RIBBON ASM. SEE LIST 42.

LIST AND INDEX NO.	PART NO.	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		TYPEHEAD, CARDHOLDER, AND RIBBON ASM		
42 -	NO NO.	TYPEHEAD, CARDHOLDER, AND RIBBON ASM. SEE FIGURE 42 FOR ILLUSTRATION	NP	
- 1	1136076	. CARTRIDGE ASM-RIBBON	1	
- 3	1167001	. TYPEHEAD ASM- 12P SCRIBE USA	1	
- 3	1167005	. TYPEHEAD ASM- 12P LETTER GOTHIC USA	1	
- 3	116700E	. TYPEHEAD ASM- 10P MANIFOLD PICA NOS.USA	1	
- 3	1167007	. TYPEHEAD ASM- 12P ELITE 72 USA	1	
- 3	116700B	. TYPEHEAD ASM- 10P PICA 72 USA	1	
- 3	116701C	. TYPEHEAD ASM- 10P MANIFOLD 72 USA	1	
- 3	1167012	. TYPEHEAD ASM- 12P PRESTIGE ELITE #2 USA	1	
- 3	1167014	. TYPEHEAD ASM- 12P LIGHT ITALIC USA	1	
- 3	1167015	. TYPEHEAD ASM- 10P COURIER 72 USA	1	
- 3	1167019	. TYPEHEAD ASM- 10P MANIFOLD CANCEL U USA	1	
- 3	1167020	. TYPEHEAD ASM- 12P DUAL GOTHIC USA	1	
- 3	1167029	. TYPEHEAD ASM- 10P 4 GRAPHICS USA	1	
- 3	1167030	. TYPEHEAD ASM- 12P ADJUTANT USA	1	
- 3	1167043	. TYPEHEAD ASM- 10P COURIER 72 120 CHAIN 1	1	
- 3	116705C	. TYPEHEAD ASM- 10P ADVOCATE USA	1	
- 3	1167070	. TYPEHEAD ASM- 10P DELEGATE USA	1	
- 3	116709C	. TYPEHEAD ASM- 12P SCRIPT USA	1	
- 3	1167938	. TYPEHEAD ASM- 10P DATA #1 UC-LC USA	1	
- 3	1167939	. TYPEHEAD ASM- 10P DATA #1 UC-UC USA	1	
- 3	1167940	. TYPEHEAD ASM- 10P DATA #1 UC-LC USA	1	
- 3	1167941	. TYPEHEAD ASM- 10P DATA #1 UC-UC USA	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
42 - 3	1167942	. TYPEHEAD ASM- 10P DATA #1 UC-LC USA	1	
- 3	1167943	. TYPEHEAD ASM- 10P DATA #1 UC-UC USA	1	
- 3	1167947	. TYPEHEAD ASM- 10P DATA #1 UC-UC USA	1	
- 3	1167948	. TYPEHEAD ASM- 10P DATA #1 UC-LC USA	1	
- 3	1167961	. TYPEHEAD ASM- 10P DATA #1 UC-LC USA	1	
- 3	1167962	. TYPEHEAD ASM- 10P DATA #1 UC-UC USA	1	
- 3	1167963	. TYPEHEAD ASM- 10P PTTC/8 GRAPHICS USA	1	
- 3	1167970	. TYPEHEAD ASM- 10P DATA #1 UC-UC USA	1	
		THE ABOVE TYPEHEAD ASSEMBLIES ARE FOR USE CNLY CN 2740 AND 2741 DOMESTIC MACH.		
- 3	1167072	. TYPEHEAD ASM- 10P CORRESPONDENCE 72 USA	1	
- 3	1167964	. TYPEHEAD ASM- 12P HFC	1	
- 3	1167986	. TYPEHEAD ASM- 10P	1	
		THE FOLLOWING TYPEHEAD ASSEMBLIES ARE FOR USE ONLY ON 2740 AND 2741 WTC MACH.		
- 3	1167016	. TYPEHEAD ASM- 10P DATA #1 UC-LC USA	1	
- 3	1167822	. TYPEHEAD ASM- 10P DATA #1 DENMARK/NORWAY	1	
- 3	1167823	. TYPEHEAD ASM- 10P DATA #1 UC-LC ITALY	1	
- 3	1167824	. TYPEHEAD ASM- 10P DATA #1 DENMARK/NORWAY	1	
- 3	1167825	. TYPEHEAD ASM- 10P DATA #1 UC-LC ITALY	1	
- 3	1167826	. TYPEHEAD ASM- 10P DATA #1 UC-LC UK	1	
- 3	1167827	. TYPEHEAD ASM- 10P DATA #1 UC-LC GERMANY	1	
- 3	1167828	. TYPEHEAD ASM- 10P DATA #1 SWEDEN/FINLAND	1	
- 3	1167829	. TYPEHEAD ASM- 10P DATA #1 UC-LC GERMANY	1	
- 3	1167830	. TYPEHEAD ASM- 10P DATA #1 UC-LC UK	1	
- 3	1167832	. TYPEHEAD ASM- 10P DATA #1 UC-LC GERMANY	1	
- 3	1167834	. TYPEHEAD ASM- 10P DATA #1 UC-LC ITALY	1	
- 3	1167835	. TYPEHEAD ASM- 10P DATA #1 SWEDEN/FINLAND	1	
- 3	1167837	. TYPEHEAD ASM- 10P DATA #1 DENMARK/NORWAY	1	
- 3	1167839	. TYPEHEAD ASM- 10P DATA #1 UC-LC UK	1	
- 3	1167996	. TYPEHEAD ASM- 12P PTTC/8 MONO-USA	1	
- 3	1167998	. TYPEHEAD ASM- 10P PTTC/8 MONO-USA	1	
- 3	1167997	. TYPEHEAD ASM- 12P DATA#2 DUAL USA	1	
- 3	1167640	. TYPEHEAD ASM- 12P DUAL GOTHIC	1	
- 3	1167087	. TYPEHEAD ASM- 10P MANIFOLD/PICA NUMERAL	1	
- 3	1167733	. TYPEHEAD ASM- 12P DATA #2	1	
- 3	1167840	. TYPEHEAD ASM- 10P DATA #1 UC-LC UK	1	
- 3	1167844	. TYPEHEAD ASM- 10P DATA #1 SWEDEN/FINLAND	1	
- 6	1141809	. HOLDER,CARD- 10 PITCH STD PLASTIC	1	
- 6	1141810	. HOLDER,CARD- 12 PITCH STD PLASTIC	1	
- 6	1128532	. HOLDER,CARD 10 PITCH PIN FEED METAL	1	
- 6	1135780	. HOLDER,CARD 12 PITCH PIN FEED METAL	1	
- 6	1124601	. HOLDER,CARD- 10 PITCH STD METAL	1	
- 6	1124602	. HOLDER,CARD- 12 PITCH STD METAL	1	
- 7	1091151	. . SCREW,MACH-FH 4-40 X 0.086 LG	2	
- 8	1138796	. . WASHER,FLAT- 0.113 ID 0.328 OD 0.020 THK	2	
- 9	1123829	. . BRACKET	1	
- 10	1123830	. . BRACKET	1	
- 11	1141928	. . SCREW,ASM FL WASH-PAN HD 4-40 X 0.312 LG	2	

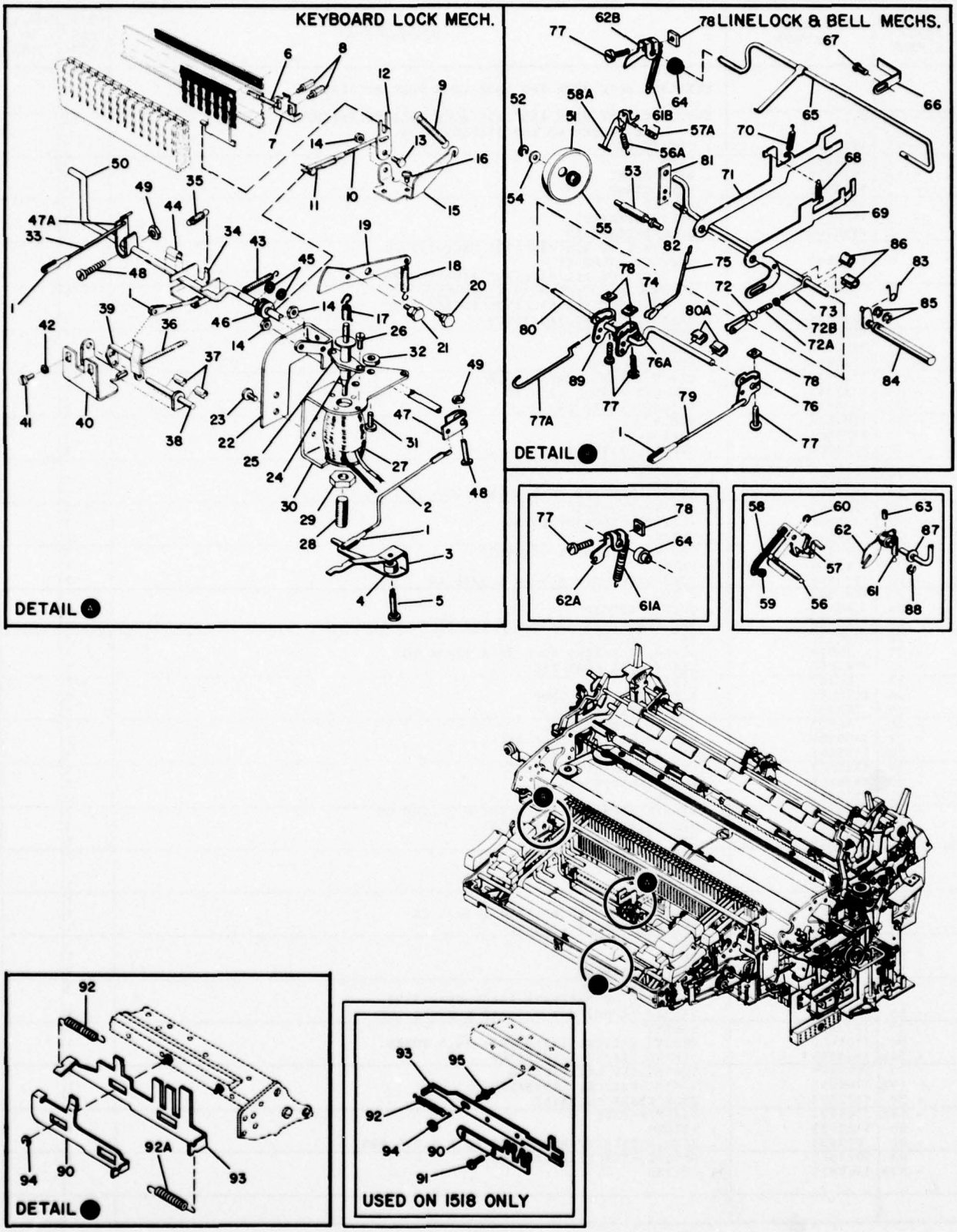


FIGURE 43. KEYBOARD LOCK MECH AND LINE LOCK BELL MECHANISM. SEE LIST 43.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		KEYBOARD LOCK MECH AND LINE LOCK BELL MECHANISM		
43 - NO	NO.	KEYBOARD LOCK MECH AND LINE LOCK BELL MECHANISMS SEE FIGURE 43 FOR ILLUSTRATION	NP	
- 1	1070020	. CLEVIS-LINK	2	
- 2	1128890	. LINK	1	
- 3	1128877	. BELL CRANK	1	
- 3	1144933	. BELL CRANK	1	
- 4	1128885	. SPACER	1	
- 5	1128879	. SCREW-SPECIAL	1	
- 6	1166440	. LOCK-INTERPOSER	1	
		USED ON ALL MACHINES EXCEPT 2970		
- 7	1166437	. SUPPORT-INTPR LK	2	
		USED ON ALL MACHINES EXCEPT 2970		
- 8	186923	. SCREW-CAP,SOC HD 4-40 X 1/4 LG	4	
		USED ON ALL MACHINES EXCEPT 2970		
- 9	1090175	. SPRING,HELICAL,EXTENSION	1	
- 10	1166436	. LINK-INTPOSER LK	1	
- 11	1123754	. CLEVIS	1	
- 12	1135496	. LEVER-KB LOCK	1	
- 13	1135130	. PIVOT SCREW, LEVER LATCH	1	
- 14	37913	. NUT-HEX 4-40 X .250 ID	3	
- 15	1135498	. BRACKET-LEVER LK	1	
- 16	1164576	. SCREW	2	
- 17	1128648	. SPRING-COIL	1	
- 18	1124206	. SPRING, EXTENSION	1	
		ENERGIZE TO UNLOCK		
- 19	1128646	. LEVER	1	
- 20	1128649	. SCREW,MACH-HEX HD 4-40 X 0.252 LG	1	
- 21	1128647	. SCREW-ECCENTRIC	1	
- 22	1135234	. BRACKET, LOCKOUT LEVER	1	
- 23	1164576	. SCREW	2	
- 24	343755	. PLUNGER ASSEMBLY-SOLENOID	1	
- 25	1099884	. GUIDE	1	
- 26	1110668	. SCREW,MACH-FIL H 5-40 X 3/16 LG	2	
- 27	1135089	. COIL	1	
- 28	343752	. CORE-SOLENOID	1	
- 29	1128644	. NUT,PLAIN,HEX- 3/8-24 X 5/8 FL W	1	
- 30	1135235	. YOKE, SOLENOID	1	
- 31	35739	. SCREW,MACH-BIND HD 6-32 X 15/16 LG	1	
- 32	1145508	. SPACER-SOL CONT MTG	1	
- 33	1128881	. LINK	1	
- 34	1135511	. SLIDE AND LINK STOP	1	
- 35	183835	. SPRING-EXTENSION	1	
- 36	46831	. SPRING, EXTENSION	1	
- 37	1138384	. RETAINER, INTERLOCK BAIL	2	
- 38	1135506	. ROD-PIVOT PAWL STOP	1	
- 39	1135507	. STOP-CYCLE CLUTCH PAWL	1	
- 40	1135508	. BRACKET-STOP MTG	1	
- 41	1164582	. SCREW	2	
- 42	338169	. WASHER,LOCK-EXT TEETH NO. 4 X .260 OD	2	
- 43	1091618	. SPRING,HELICAL,EXTENSION	1	
- 44	1138464	. CLIP-RETAINER	1	
- 45	1092125	. RING-RETAINING	2	
- 46	1128884	. ROLLER, KEYLOCK BAIL	1	
- 47	1128928	. CRANK	1	
- 47A	1135603	. CRANK-SHAFT	1	
- 48	438549	. SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
- 49	37913	. NUT-HEX 4-40 X .250 ID	1	
- 50	1128864	. BAIL	1	
- 51	1133628	. BELL	1	
- 52	1073418	. RING-RETAINING	1	
- 53	1141117	. STUD-BELL MTG	1	
		USED ON MACHINES BELOW SN4011720		
- 54	1090394	. WASHER,FL-NO. 8 X 5/16 ID X 0.010 THK	1	
- 55	1133627	. GROMMET	1	
- 56	1106650	. SPRING,HELICAL,EXTENSION- 21.5 TURNS	1	
- 56A	1164849	. SPRING,HELICAL,EXTENSION	1	
- 57	1073449	. SPRING,TAB LEVER LATCH	1	
- 57A	1164845	. SPRING-HELICAL EXTENSION	1	
- 58	1132027	. BELL CRANK ASSEMBLY	1	
- 58A	1164721	. CLAPPER-BELL	1	
- 59	1123623	. WEIGHT	1	
- 60	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	1	
- 61	1091069	. SPRING,HELICAL,EXTENSION	1	
- 61A	1164433	. SPRING	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
43 - 61B	1164849	. SPRING,HELICAL,EXTENSION	1	
- 62	NO NO.	. LEVER-BELL RAIL	NP	
		OBSOLETE-NOT AVAILABLE-FOR REPLACEMENT ORDER 1132012 WITH 1164433, 1132013, 1134829, AND 1928		
- 62A	1132012	. LEVER ASSEMBLY	1	
- 62B	1164847	. LEVER-BELL RAIL	1	
- 63	257957	. SETSCREW	1	
- 64	1132013	. SPACER	1	
- 65	1128173	. BAIL ASSEMBLY, BELL CLAPPER	1	
- 66	1123622	. STOP-BELL RINGER RAIL	1	
- 67	265195	. SCREW,MACH-HEX HD 6-32 X 7/32 LG	1	
- 68	45119	. SPRING,EXTENSION	1	
- 69	1133597	. LEVER-KEYBOARD LOCK	1	
- 70	123552	. SPRING,HELICAL,EXTENSION- 21 TURNS	1	
- 71	1133598	. LEVER-KEYBOARD LOCK	1	
- 72	1159443	. CLEVIS	1	
- 72A	1159239	. SPRING	1	
- 72B	1090472	. WASHER	1	
- 73	1159241	. LINK	1	
- 74	1123754	. CLEVIS	1	
- 75	1000223	. LINK, CONNECTING	1	
- 76	1124435	. LEVER	1	
- 76A	1159129	. LEVER	1	
- 77	1928	. SCREW,MACH-RH 6-32 X 1/2 LG	3	
- 77A	1176851	. LINK-KB LOCK	1	
- 78	1134829	. NUT	3	
- 79	1133520	. LINK	1	
- 79	1141834	. LINK-LOCKOUT	1	
		USED ON ALL MACH. EXCEPT 1518 AND 2970		
- 80	1124414	. BAIL	1	
- 80A	1138464	. CLIP-RETAINER	2	
- 81	1132009	. BRACKET	1	
- 82	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	2	
- 83	1159240	. SPRING-TOGGLE	1	
- 84	1159244	. LEVER-LOCK OUT	1	
- 85	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK	2	
- 86	1092125	. RING-RETAINING	2	
		USED ON ALL MACH. EXCEPT 1518 AND 1980		
- 86	1138464	. CLIP-RETAINER	2	
- 87	45677	. WASHER,FL- 5/32 X 7/16 OD X 0.040 THK	1	
- 87	257986	. WASHER,FLAT NO. 6	1	
- 88	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK	1	
- 89	1159129	. CLAMP-LOCKOUT LEVER	1	
- 89	1159129	. CLAMP-LOCKOUT LEVER	2	
- 90	1128892	. COMB-ADJUSTABLE	1	
- 90	1176847	. COMB	2	
- 91	15887	. SCREW,MACH-BIND HD 2-56 X 1/8 LG	2	
- 92	1090404	. SPRING,HELICAL,EXTENSION	1	
- 92	6351	. SPRING,HELICAL,EXTENSION	1	
- 92A	1123827	. SPRING,HELICAL,EXTENSION	1	
- 93	1128874	. COMB ASSEMBLY-1518	1	
- 93	1176848	. COMB-EARLY STYLE	1	
- 93	1187518	. COMB,OP.LOCKOUT-LATE STYLE	1	
- 94	1073418	. RING-RETAINING	2	
- 95	1128880	. STUD	2	

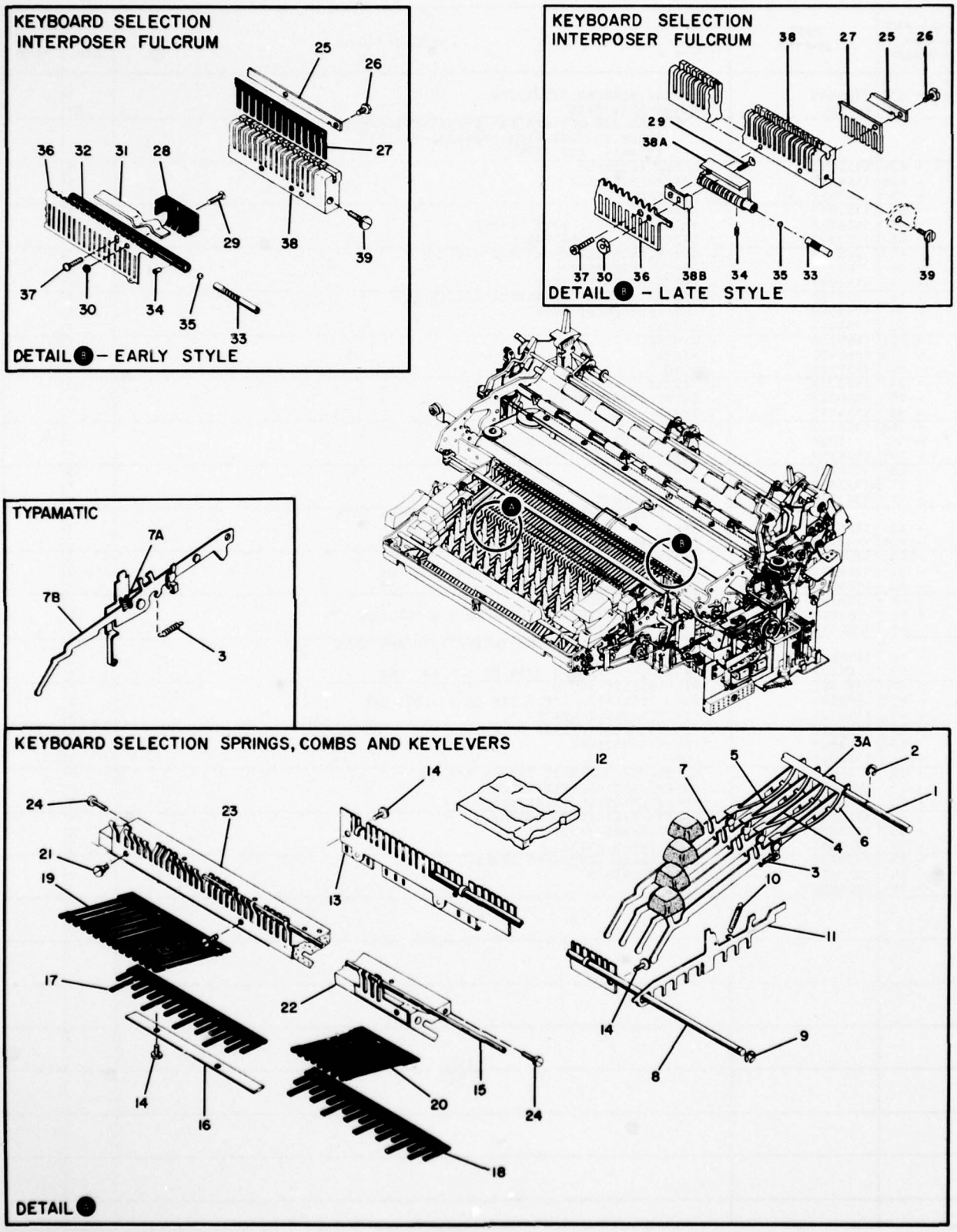
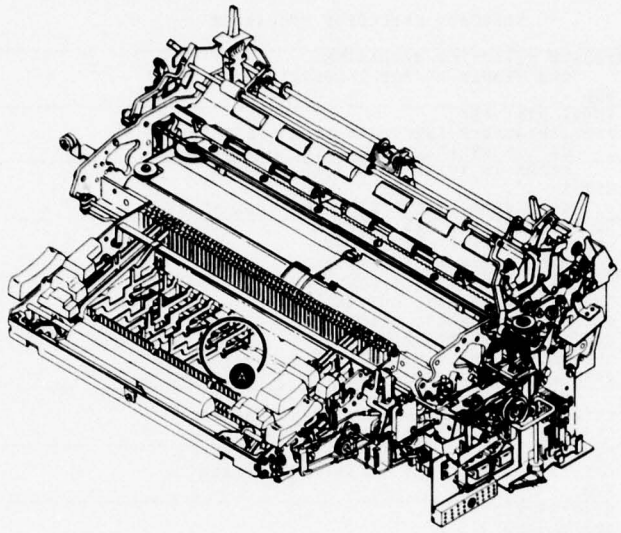


FIGURE 44. KEYBOARD SELECTION MECHANISM. SEE LIST 44.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		KEYBOARD SELECTION MECHANISM		
44 -	NO NO.	KEYBOARD SELECTION MECHANISM SEE FIGURE 44 FOR ILLUSTRATION	NP	
- 1	1132166	. ROD	1	
- 1	1272679	. INDEX DIAL FBM	1	
- 2	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK CN 935 TYPAMATICS LOCATED OPPOSITE AS SHOWN IN THIRD SLCT FROM LH SIDE	1	
- 3	1164080	. SPRING USED WHEN FINGER OF INDEX 135A BREAKS	45	
- 3A	1164431	. SPRING-KEYLEVER PAWL LEFT	1	
- 3A	1164574	. SPRING-KEYLEVER PAWL RIGHT	1	
- 4	1123949	. KEYLEVER ASSEMBLY, THIRD ROW	11	
- 5	1123948	. KEYLEVER ASSEMBLY, SECOND ROW	11	
- 6	1123950	. KEYLEVER ASSEMBLY, FOURTH ROW	10	
- 7	1123947	. KEYLEVER ASSEMBLY, FIRST ROW	12	
- 7A	1134972	. SPRING 2741 W/TYPAMATIC	1	
- 7A	45119	. SPRING,EXTENSION 935-2741 W/TYPAMATIC,U.K.	1	
- 7A	10514	. SPRING,HELICAL,EXTENSION- 20 TURNS 935-2741, W/TYPAMATIC,NOR/SWED/FN	1	
- 7B	1176591	. KEYLEVER-REPEAT 935 TYPAMATIC DOMESTIC	1	
- 7B	1186037	. KEYLEVER-REPEAT 935 TYPAMATIC U.K.	1	
- 7B	1186036	. KEYLEVER-REPEAT 935 TYPAM. NOR/SWED/FIN	1	
- 7B	1186038	. KEYLEVER-REPEAT 935 TYPAMATIC DENMARK	1	
- 8	1123963	. ROD	1	
- 9	1092125	. RING-RETAINING	2	
- 10	1141266	. SPRING-ROW 1 & 2	23	
- 10	1141267	. SPRING, ROW 3 & 4		
- 11	1158900	. INTERPOSER-POS 0 BREAK OF LUG AS REQUIRED	1	
- 12	1203239	. INSULATION, KEYBOARD	1	
- 13	1141381	. COMB ASSEMBLY	1	
- 14	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG	8	
- 15	1133633	. UPSTOP	1	
- 16	1133679	. PLATE, KEYLEVER SPRING	1	
- 17	1133682	. COMB, KL RETURN LH,1518	1	
- 17	1176922	. COMB-LH 835 935	1	
- 18	1133683	. COMB, R.H.	1	
- 19	1133647	. SPRING-KL RETURN,1518	1	
- 19	1176871	. SPRING-LH 835 935	1	
- 20	1133654	. SPRING-KL RETURN	1	
- 21	1164576	. SCREW	2	
- 22	1123968	. COMB, KL GUIDE,1518	1	
- 22	1176845	. COMB GUIDE	1	
- 23	1128895	. SUPPORT,1518	1	
- 23	1176858	. SUPPORT-COMB GUIDE	1	
- 24	1141929	. SCREW-FRONT MTG	4	
- 25	1124433	. PLATE,INT SPRING	1	
- 26	1128382	. SCREW, 4-40 NC-2A,EARLY STYLE	6	
- 26	1138975	. SCREW,LATE STYLE	6	
- 27	1124430	. SPRING-INTERPOSER LATCH	4	
- 28	1187198	. CLAMP,EARLY STYLE	4	
- 29	438558	. SCREW,PLATE MTG	4	
- 30	38214	. NUT,PLAIN,HEX- 4-40 X 1/4 FL W	4	
- 31	1134981	. SPACER, COMP TUBE ASSEMBLY,1518	1	
- 31	1187239	. SPACER,COMPENSATOR TUBE ASSEMBLY,EARLY STYLE	1	
- 32	1132186	. TUBE, KEYBOARD COMPENSATOR,EARLY STYLE	1	
- 33	1141861	. PLUNGER	2	
- 34	1141860	. SETSCREW	2	
- 35	1124682	. BALL, COMPENSATOR, S ST, 0.18750 DIA	46	
- 36	1134987	. PLATE ASSEMBLY, INTERPOSER	1	
- 37	1164583	. SCREW,MACH-BINDING HD 4-40 X 0.625 LG,EARLY STYLE	4	
- 37	1138975	. SCREW,LATE STYLE	4	
- 38	1135495	. SUPPORT,FULCRUM	1	
- 38A	1148451	. TUBE,KB COMPENSATOR,LATE STYLE	1	
- 38B	1148453	. SPACER,LATE STYLE	4	
- 39	1141929	. SCREW-FRONT MTG	2	



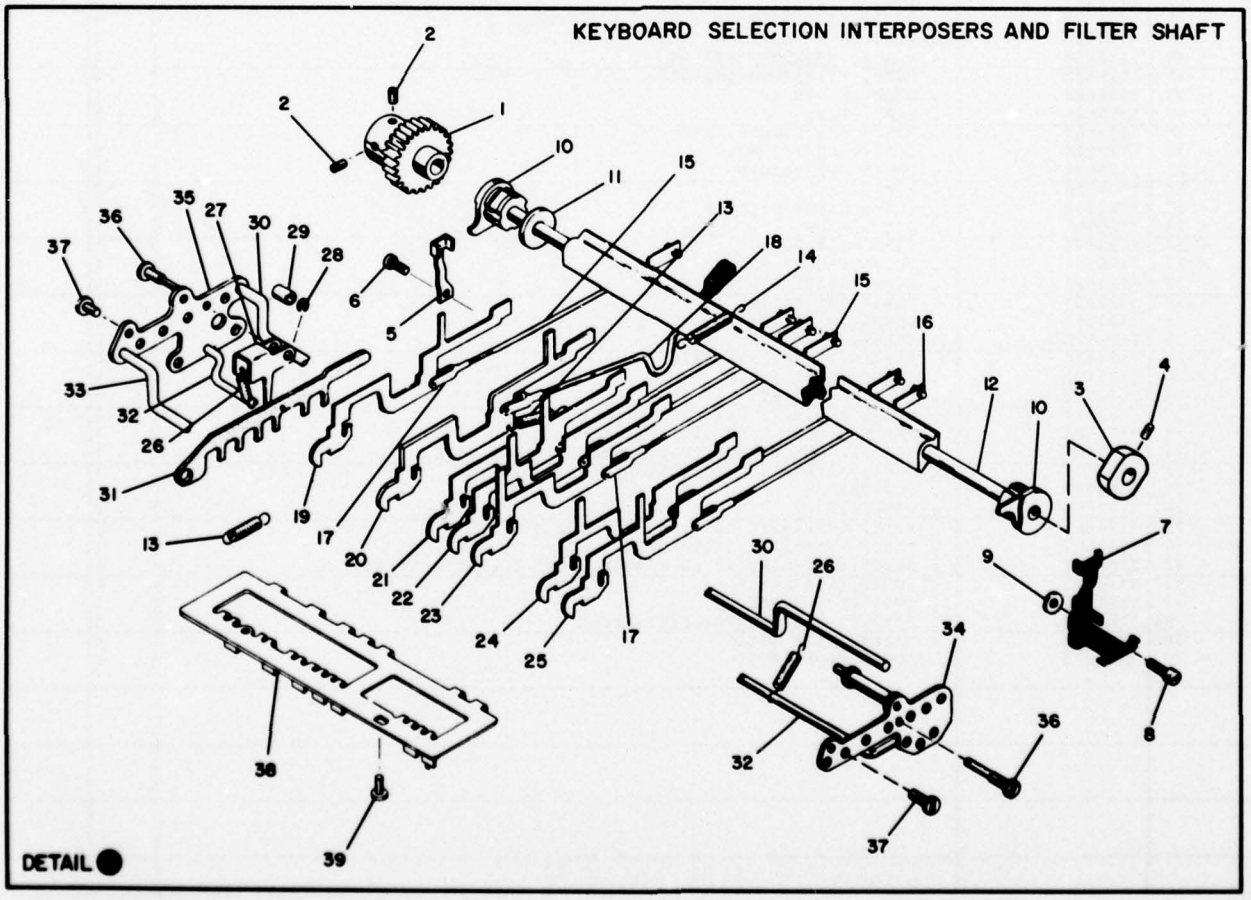
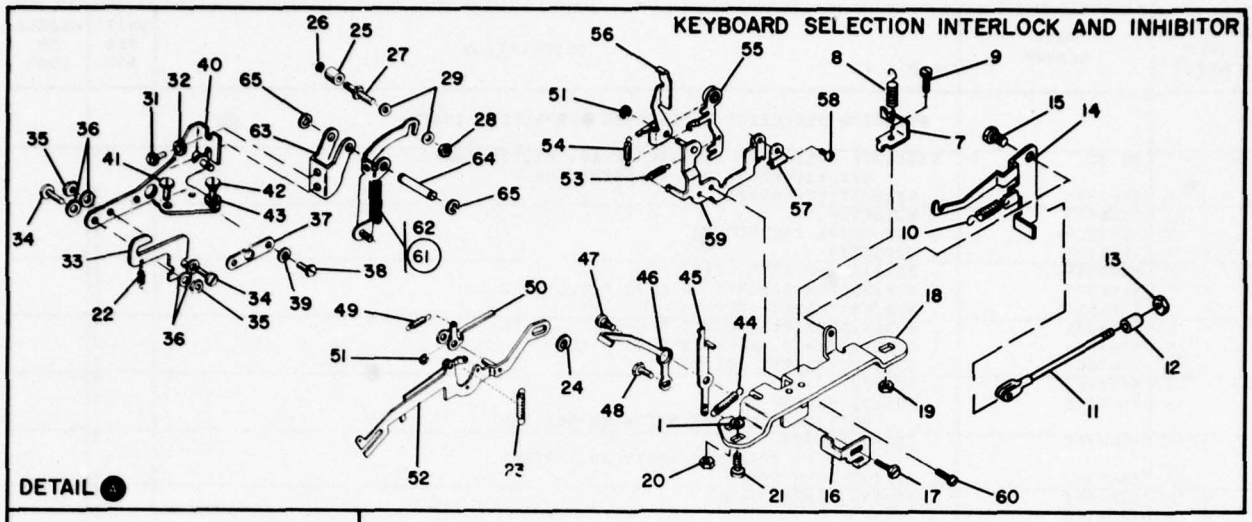
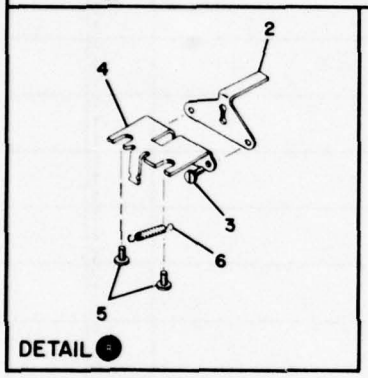


FIGURE 45. KEYBOARD SELECTION INTERPOSER AND FILTER SHAFT. SEE LIST 45.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		KEYBOARD SELECTION INTERPOSER AND FILTER SHAFT		
45 -	NO NO.	KEYBOARD SELECTION INTERPOSER AND FILTER SHAFT SEE FIGURE 45 FOR ILLUSTRATION	NP	
- 1	1164761	. GEAR-FILTER SHAFT	1	
- 2	1175107	. SETSCREW	2	
- 3	1187205	. CAM-SHIFT INTERLOCK	1	
- 4	1175107	. SETSCREW	1	
- 5	1141895	. RETAINER-FILTER SHAFT BRG	1	
- 6	1164577	. SCREW,MACH-BINDING HD 6-32 X 0.312 LG	1	
- 7	1141651	. BRACKET-CABLE ANCHOR	1	
- 8	170215	. SCREW,ASMD WASHER-FIL H 6-32 X 3/8 LG	1	
- 9	1141896	. SPACER,FI- 0.140 ID X 0.0500 THK	2	
- 10	1141663	. BEARING-FILTER SHAFT	2	
- 11	1128144	. SPACER	1	
- 12	1138810	. SHAFT, FILTER USED ON MACHINES BELOW SN 4625064	1	
- 12	1164760	. SHAFT-FILTER USED ON MACHINES ABOVE SN 4625064	1	
- 13	1141383	. SPRING-INTERPOSER	7	
- 14	1071691	. SPRING, EXTENSION	1	
- 15	1135168	. LINK	5	
- 16	1133586	. LINK- 5 LATCH	1	
- 17	1070020	. CLEVIS-LINK	7	
- 18	1128573	. LINK ASSEMBLY	1	
- 18	1166049	. LINK-FLAT STAMPED	1	
- 19	1141379	. INTERPOSER-POS 1	1	
- 20	1135605	. INTERPOSER-CK LAT	1	
- 21	1141378	. INTERPOSER-POS 3	1	
- 22	1141376	. INTERPOSER-POS 4	1	
- 23	1141374	. INTERPOSER-POS 5	1	
- 24	1141375	. INTERPOSER-POS 6	1	
- 25	1141377	. INTERPOSER-POS 7	1	
- 26	1134831	. SPRING,HELICAL,EXTENSION	2	
- 27	1134768	. DAMPER-CYCLE RAIL	2	
- 28	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	2	
- 29	1134784	. SPACER	1	
- 30	1135096	. RAIL-CHECK	1	
- 31	1133579	. INTERPOSER-RAIL STOP	1	
- 32	1123556	. RAIL-CYCLE CLUTCH TRIP	1	
- 33	1123961	. RAIL-KEYBOARD	6	
- 34	1128866	. PLATE ASSEMBLY-RAIL ANCHOR RH	1	
- 35	1135097	. PLATE ASSEMBLY, RAIL ANCHOR LH	1	
- 36	1132150	. SCREW-RAIL ANCHOR	2	
- 37	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 38	1141382	. BRACKET-LAT INT GD	1	
- 38	1176902	. BRACKET- 835 935	1	
- 39	1164576	. SCREW	2	





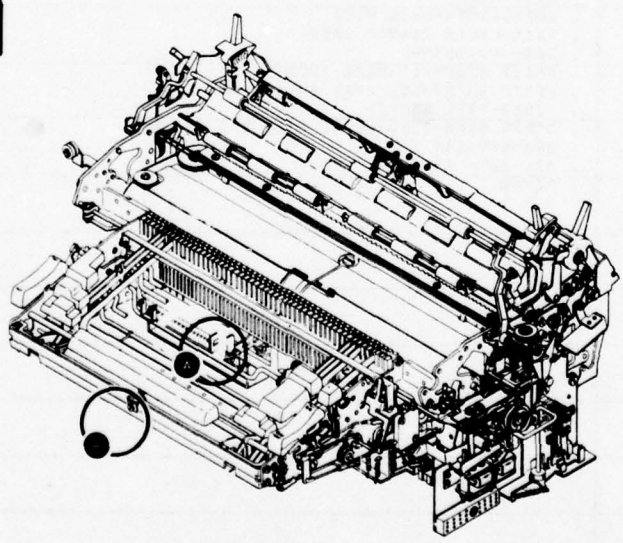


FIGURE 46. KEYBOARD SELECTION INTERLOCK AND INHIBITOR MECHANISM. SEE LIST 46.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		KEYBOARD SELECTION INTERLOCK AND INHIBITOR MECHANISM		
46 -	NO NO.	KEYBOARD SELECTION INTERLOCK AND INHIBITOR MECHANISM SEE FIGURE 46 FOR ILLUSTRATION	NP	
- 1	109084C	. WASHER	2	
- 2	1134887	. KEEPER ASSEMBLY, CYCLE CLUTCH REL LAT	1	
- 3	1164582	. SCREW	2	
- 4	1135493	. BRACKET-CYCLE CLUTCH KEEP	1	
- 5	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG	2	
- 6	43373	. SPRING,HELICAL,EXTENSION- 26.5 TURNS	1	
- 7	117689C	. BRACKET-SPRING MTG CYL CLU TRIP	1	
- 8	1144376	. SPRING-CYCLE CLUTCH LATCH	1	
- 9	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	1	
- 10	1090343	. SPRING,HELICAL,EXTENSION	1	
- 11	1166088	. LINK ASSEMBLY	1	
- 12	1128685	. WASHER-SHOCK ABSORBER	1	
- 13	1159716	. NUT-OPERATIONAL PULL LINK ADJ	1	
- 14	1135129	. LEVER LATCH, CYCLE CLUTCH TRIP	1	
- 15	1135130	. PIVOT SCREW, LEVER LATCH	1	
- 16	1176887	. STOP-SHIFT INTLK	1	
- 17	265195	. SCREW,MACH-HEX HD 6-32 X 7/32 LG	1	
- 18	1135125	. MOUNTING BRACKET, CYCLE CLUTCH TRIP	1	
- 19	38051	. NUT-FRICTION LATCH MOUNTING	1	
- 20	37913	. NUT-HEX 4-40 X .250 ID	1	
- 21	1159955	. SCREW-ECC LOCKING	1	
- 22	1128327	. SPRING	1	
- 23	1123827	. SPRING,HELICAL,EXTENSION	1	
- 24	1073418	. RING-RETAINING	1	
- 25	1138391	. ROLLER, RESTORING CAM	1	
- 26	251989	. RING,RETAINING	1	
- 27	1138390	. STUD, RESTORING CAM	1	
- 28	37913	. NUT-HEX 4-40 X .250 ID	1	
- 29	1132211	. WASHER, FLAT	2	
- 31	1128698	. SCREW,MACH-HEX HD 4-40 X 3/16 LG	2	
- 32	150209	. WASHER,STAR- 0.115, 0.270 M	2	
- 33	1134767	. STOP	1	
- 34	1164109	. SCREW-INDEX BAIL PI	2	
- 35	37913	. NUT-HEX 4-40 X .250 ID	2	
- 36	45639	. WASHER,FL-NO. 4 X 5/16 OD X 0.020 THK	4	
- 37	1141129	. PLATE, BAIL SHAFT	1	
- 38	265195	. SCREW,MACH-HEX HD 6-32 X 7/32 LG	1	
- 39	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	1	
- 40	1123687	. BRACKET, SELECTOR BAIL	1	
- 41	1164576	. SCREW	2	
- 42	1127733	. SCREW,MACH-SLTD HD 6-32 X 1/4 LG	1	
- 43	150209	. WASHER,STAR- 0.115, 0.270 M	1	
- 44	43373	. SPRING,HELICAL,EXTENSION- 26.5 TURNS	1	
- 45	1159173	. LEVER-CYCLE CLUTCH	1	
- 46	1159182	. LEVER-INHIBITOR TRIP	1	
- 47	1159185	. SCREW,SHLDR- 0.139 DIA 0.055 LG 4-40 THD	1	
- 48	1100951	. SCREW,MACH-HEX HD 3-48 X 0.203 LG HARDEN	1	
- 49	1073449	. SPRING,TAB LEVER LATCH	1	
- 50	1159171	. LEVER-INHIBITOR	1	
- 51	1073418	. RING-RETAINING	2	
- 52	1128632	. PAWL AND LINK ASSEMBLY	1	
- 53	45119	. SPRING,EXTENSION	1	
- 54	1133659	. SPRING,HELICAL,EXTENSION	1	
- 55	1176876	. ARM-CC SHIFT INPUT	1	
- 56	117688E	. ARM-CC SHIFT INTLK	1	
- 57	1176884	. CLAMP	1	
- 58	1164584	. SCREW,MACH-BINDING HD 4-40 X 0.149 LG	1	
- 59	1176879	. PLATE-CC SHFT INLK	1	
- 60	1164582	. SCREW	2	
- 61	1266829	. BRACKET ASSEMBLY, CYCLE CLUTCH LATCH	1	
- 62	1135124	. . ARM ASM	1	
- 63	1175616	. . BRACKET	1	
- 64	1175545	. . PIN	1	
- 65	219633	. . RING, RETAINER	2	

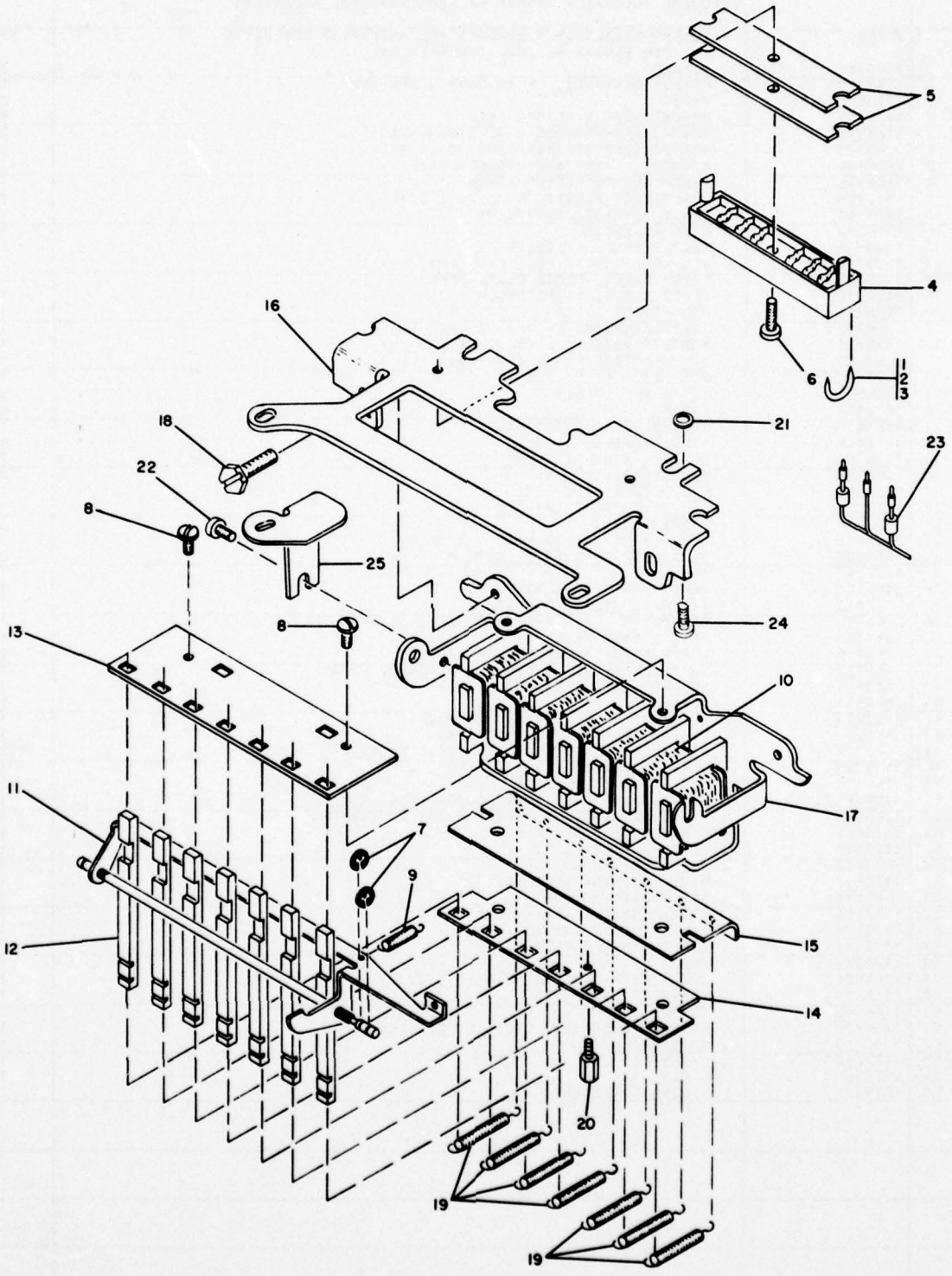


FIGURE 47. 48V PRINT SELECTION MAGNET ASSEMBLY (EARLY STYLE). SEE LIST 47.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		48V PRINT SELECTION MAGNET ASSEMBLY (EARLY STYLE)		
47 -	NO NO.	PRINT SELECTION MAGNET ASSEMBLY 48V SEE FIGURE 48 FOR LATE STYLE AND FIGURE 47 FOR ILLUSTRATION	NP	
- 1	129242	. JUMPER ASM-BLU 2-1/2 20AWG 1 LUG EA END	5	
- 2	129243	. JUMPER ASM-BLU 3-1/2 20AWG 1 LUG EA END	1	
- 3	205329	. JUMPER-BRASS,3/16	1	
- 4	302090	. CONNECTOR,RECP,ELEC- 24 FEMALE CONTACTS	2	
- 5	302131	. STRIP-TERMINAL BLOCK INSULATOR	4	
- 6	438549	. SCREW,MACH-BIND HD 4-40 X 7/16 LG	2	
- 7	1073418	. RING-RETAINING	2	
- 8	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	4	
- 9	1134831	. SPRING,HELICAL,EXTENSION	1	
- 10	1135134	. COIL ASSEMBLY, PRINT MAGNET	7	
- 11	1166547	. ARM ASM-KNOCKOFF AND CYCLE CLUTCH TRIP	1	
- 12	1159972	. ARMATURE-SELECTION CHROME	7	
- 12	1166548	. ARMATURE-SELECTION USED ONLY WITH STAINLESS STEEL TRIP RAIL	7	
- 13	1159973	. STOP-SELECTION ARMATURE	1	
- 14	1159974	. GUIDE-ARMATURE	1	
- 15	1159975	. PIVOT-ARMATURE	1	
- 16	1159978	. BRACKET-MAGNET ASSEMBLY	1	
- 17	NO NO.	. CORE ASSEMBLY-SELECTION MAGNET-REF. ONLY-ORDER 1159545,FIGURE 48	NP	
- 18	1166053	. SCREW	2	
- 19	1166203	. SPRING-ARMATURE	7	
- 20	1187152	. STUD-SELECTION ARM GUIDE MTG	1	
- 21	1090840	WASHER	4	
- 22	1117759	SCREW,MACH-BINDING HD 6-32 X 0.188 LG	1	
- 23	1135575	DIODE ASSEMBLY-COMMON ANODE USED ONLY ON MACHINES 1518	1	
- 23	1145415	DIODE ASM-SELECTION MAGNETS USED ONLY ON MACHINES OTHER THAN 1518	1	
- 24	1164577	SCREW,MACH-BINDING HD 6-32 X 0.312 LG	4	
- 25	1166187	SUPPORT-MOUNT	1	

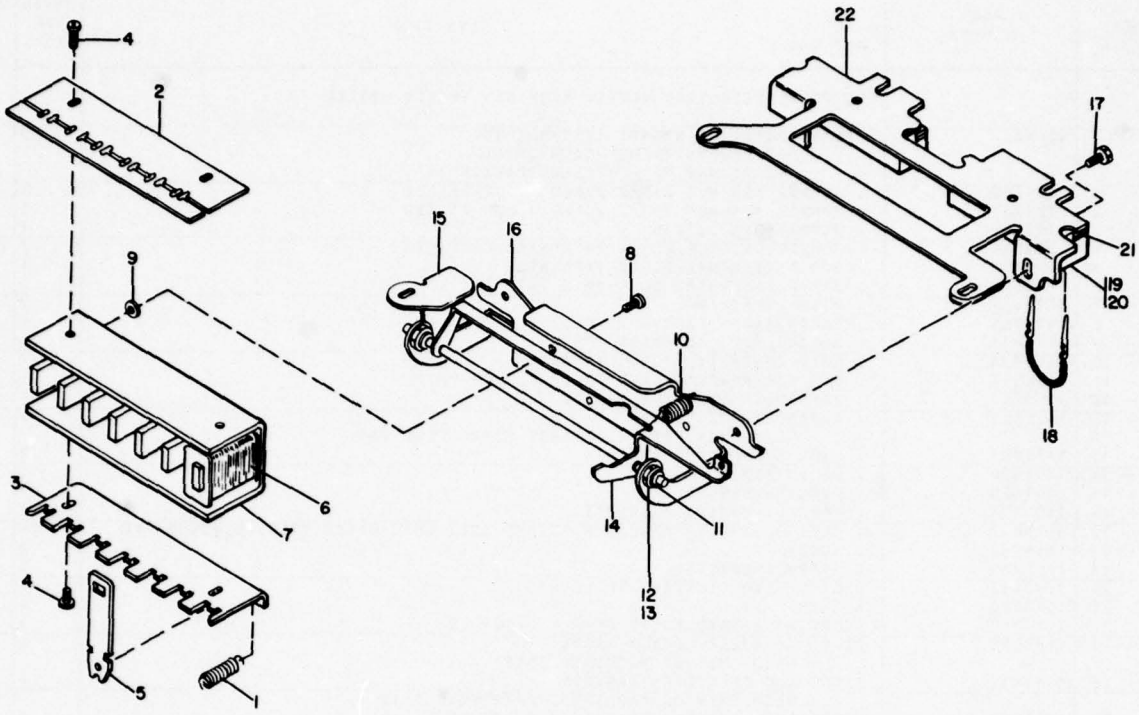


FIGURE 48. 48V PRINT SELECTION MAGNET ASSEMBLY (LATE STYLE). SEE LIST 48.

LIST AND INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4	UNITS PER ASM.	USABLE ON CODE
		48V PRINT SELECTION MAGNET ASSEMBLY (LATE STYLE)		
48 -	1159545	48V PRINT SELECTION MAGNET ASM SEE FIGURE 47 FOR CONNECTOR AND JUMPER ASM AND EARLY STYLE SEE FIGURE 48 FOR ILLUSTRATION	REF	
- 1	219765	. SPRING,EXTENSION	7	
- 2	1135483	. UPSTOP,SELECTION ARMATURE	1	
- 3	1135413	. PLATE,PIVOT	1	
- 4	1164584	. SCREW,MACH,BND HD # 4-40 UNC X .149	4	
- 5	1135055	. ARMATURE,SELECTION MAGNET	7	
- 6	1135134	. COIL ASM, PRINT MAGNET	7	
- 7	1135357	. CORE ASM, SELECTION MAGNET	1	
- 8	116458C	. SCREW, MACH, BND HD-	3	
- 9	1135746	. SPACER	3	
- 10	1134831	. SPRING,EXTENSION	1	
- 11	1187884	. GRIP RING,EXTERNAL SPOOL SHAFT	2	
- 12	1203232	. PIVOT,THREADED-# 25-32	2	
- 13	1142790	. NUT,HEX-# 25-32	2	
- 14	1203233	. ARM ASM, KNOCKOFF AND CYCLE CLUTCH TRIP	1	
- 15	1166187	. SUPPORT, MOUNT PART OF FINAL ASM	1	
- 16	1135738	. MOUNT, SELECTION MAGNET	1	
- 17	1166053	. SCREW, MACH, HEX HD-# 6-32 UNC X .180	2	
- 18	129242	. JUMPER ASM	AR	
- 18	129243	. JUMPER ASM	AR	
- 18	205329	. JUMPER ASM	AR	
- 19	302090	. BLOCK,TERMINAL	2	
- 20	438548	. SCREW,MACH-BIND HD 4-40 X 3/16 LG	4	
- 21	302131	. INSULATOR	1	
- 22	1159978	. BRACKET, MAGNET	1	

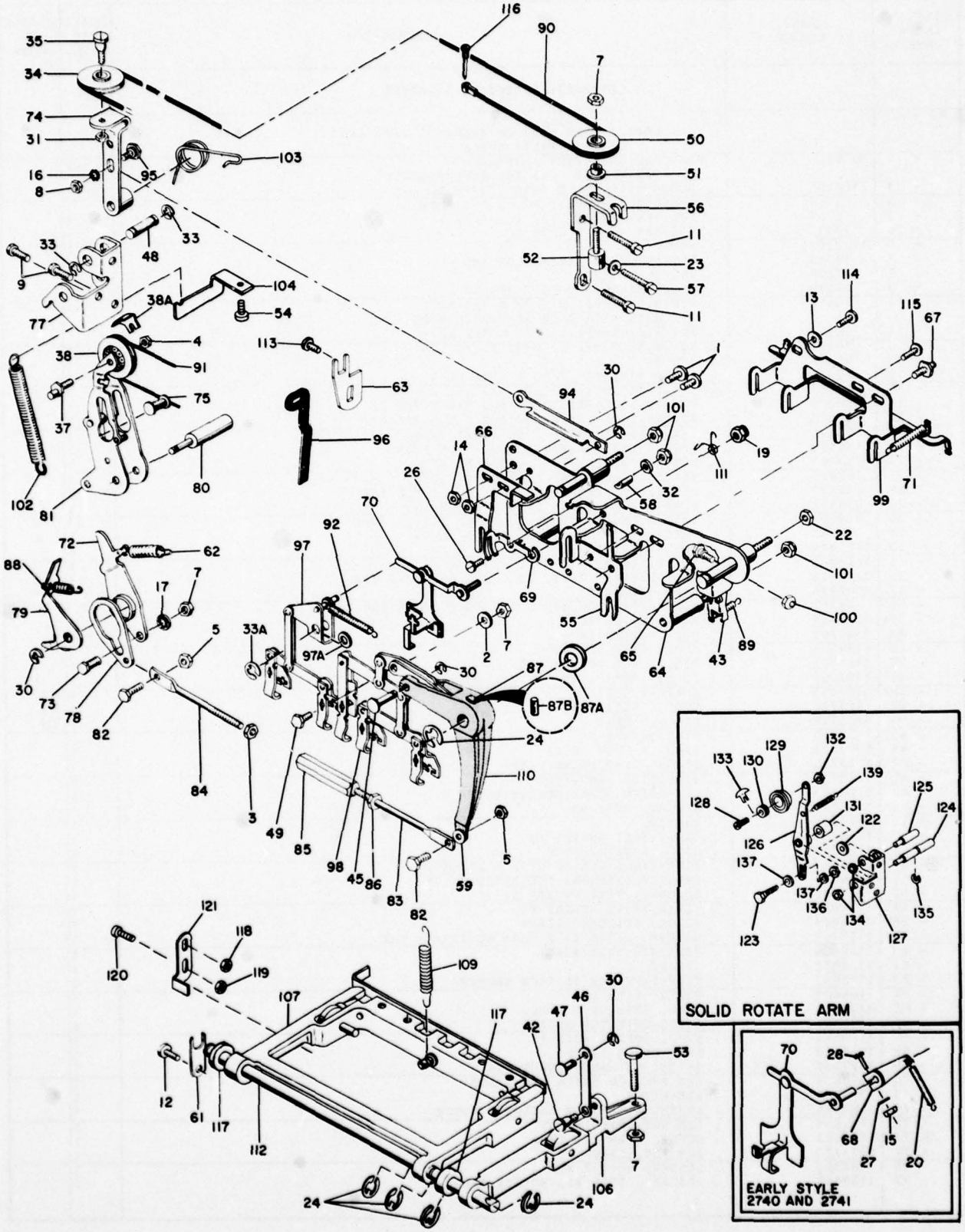


FIGURE 49. CHARACTER SELECTION ASSEMBLY. SEE LIST 49.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		CHARACTER SELECTION ASSEMBLY		
49 -		CODE A USED ONLY ON MACHINES 2740 AND 2741 EARLY STYLE		
-	NO NO.	CHARACTER SELECTION ASSEMBLY SEE FIGURE 49 FOR ILLUSTRATION	NP	
- 1	186399	. SCREW,MACH-FIL H 2-56 X 3/16 LG	1	
- 2	6364	. WASHER,LOCK-SPLIT NO. 6 X 1/4 OD	1	
- 3	6503	. NUT,PLAIN,HEX- 8-32 X 1/4 FL W	1	
- 4	37913	. NUT-HEX 4-40 X .250 ID	1	
- 5	1127763	. NUT	2	
- 7	38051	. NUT-FRICTION LATCH MOUNTING	4	
- 8	38214	. NUT-PLAIN,HEX	1	
- 9	38234	. SCREW,MACH-FH 6-32 X 1/4 LG	3	
- 11	38350	. SCREW,MACH-FIL H 6-32 X 1/4 LG USED WITH SNAP-IN DUST COVERS	1	
- 11	38354	. SCREW,MACH-FIL H 6-32 X 1/2 LG	1	
- 12	38351	. SCREW,MACH-FIL HD 6-32 X .312 LG	1	
- 13	45638	. SPACER	1	
- 14	47987	. NUT,PLAIN,HEX- 2-56 X 3/16 FL W	2	
- 15	47987	. NUT,PLAIN,HEX- 2-56 X 3/16 FL W	1	A
- 16	56313	. WASHER,LOCK-EXT TEETH NO. 5 X 0.280 OD	1	
- 17	62031	. WASHER,LOCK-INT TEETH NO. 6 X 0.295 OD	1	
- 19	103372	. NUT,SELF LKG,HEX- 5-40 X 1/4 FL W	1	
- 20	110956	. SPRING,HELICAL,EXTENSION- 57.5 TURNS	1	A
- 22	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL W	1	
- 23	263680	. WASHER,FL- 0.1305 ID X 0.032 THK	1	
- 24	332747	. RING,RETAINING-EXT 0.207 ID X 0.025 THK	5	
- 26	358174	. SCREW,MACH-PAN HD 2-56 X 0.105 LG	1	
- 27	358509	. WASHER,LK INT TOOTH 0.092 ID X 0.012 THK	1	A
- 28	438541	. SCREW,MACH-BIND HD 2-56 X 7/16 LG	1	A
- 30	1073418	. RING-RETAINING	4	
- 31	1090268	. NUT,PLAIN,HEX- 3-48 X 3/16 FL W	1	
- 32	1090622	. WASHER,FLAT- 0.145 ID 0.375 OD 0.040 THK	1	A
- 33	1092125	. RING-RETAINING	2	
- 33	25282	. RING-RETAINING,EXT 0.125 ID X 0.015 THK	1	
- 33A	1092125	. RING-RETAINING	1	
- 34	1123692	. PULLEY,TILT LH	1	
- 35	1134964	. STUD, TILT PULLEY	1	
- 37	1123702	. PIN,IH ROT PULLEY MTG	1	
- 38	1123704	. PULLEY,ROTATE LH	1	
- 38A	1187095	. GUARD-PULLEY	1	
- 42	1123715	. STUD,5 UNIT BAIL	1	
- 43	1123718	. LATCH,5 UNIT	1	
- 45	1123722	. STUD,ROTATE BC	1	
- 46	1123724	. LINK- 5 UNIT DRIVE	1	
- 47	1123725	. STUD,5 UNIT DRIVE LINK	1	
- 48	1123736	. STUD,TILT ARM PIVOT	1	
- 49	1123741	. ADJUSTING SCREW,ROTATE LEVER	1	
- 50	1123749	. PULLEY, TILT RH	1	
- 51	1123750	. BUSHING	1	
- 52	1123751	. STUD, TILT PULLEY RH	1	
- 53	1123779	. STUD- 5 UNIT LATCH	1	
- 54	1124157	. SCREW,MACH-HEX HD 6-32 X 21/64 LG	1	
- 55	1124622	. BRACKET-DIFFERENTIAL LEVER GUIDE	1	
- 56	1124636	. BRACKET, TILT PULLEY RH	1	
- 57	1124683	. SCREW, TILT PULLEY RH	1	
- 58	1124821	. WEDGE, SELECTOR PLATE	1	
- 59	1127741	. SLEEVE- 0.116 ID X 3/16 OD X 1/32 THK	1	
- 61	1128086	. RETAINER-BAIL SHAFT	1	
- 62	1128055	. SPRING	1	
- 63	1128091	. STOP-DAMPENER 15 INCH MACHINE	1	
- 64	1166001	. PLATE- 5 UNIT	1	
- 65	1128555	. STUD, FIVE UNIT LATCH	1	
- 66	1128556	. GUIDE-SELECTOR BAIL	1	
- 67	1128557	. STUD, SPRING ANCHOR	1	
- 68	1128558	. ARM, CHECK LATCH	1	
- 69	1128562	. GUIDE, CH LATCH PIVOT ARM	1	
- 70	1128563	. ARM ASM, CH LATCH AND PIVOT	1	A
- 70	1159790	. ARM-PIVOT	1	
- 71	1128580	. SPRING-EXTENSION SELECTOR LATCH	1	
- 72	1132051	. ARM ASM, MIDDLE ROT	1	
- 73	1132052	. SCREW, MPLR ARM LINK	1	
- 74	1203321	. ARM ASM, TILT	1	
- 75	1133503	. ROLLER, ROTATE ARM	1	
- 77	1133565	. BRACKET, TILT AND ROTATE ARM	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
49 - 78	1134966	. LINK, MEIR ARM	1	
- 79	1133568	. ARM ASM, ROTATE ECCENTRIC	1	
- 80	1133569	. STUD, ROTATE ARM PIVOT	1	
- 81	1133575	. ARM ASM, ROTATE	1	
- 82	1164089	. SCREW,SHLDR- 0.170 DIA 0.140 LG 4-40 THD	2	
		USED WITH HEAVY LINK		
- 83	1166777	. LINK-ROTATING ARM LONG	1	
- 84	1164045	. LINK-ROTATING ARM SHORT-USED ON 1203293,INDEX 126	1	
- 84	1147182	. LINK-ROTATE ARM SHORT-USED WITH 1203218,INDEX 126	1	
- 85	1133618	. NUT, ROTATE ARM LINK	1	
- 86	1133619	. NUT, ROTATE ARM LOCK	1	
- 87	1133641	. DAMPENER-TAPE	1	
- 87A	1187005	. WICK-OIL	1	
- 87B	1174099	. WICK-OIL	1	
- 88	1133662	. SPRING,HELICAL,EXTENSION	1	
- 89	1133666	. SPRING-5 UNIT LATCH	1	
- 90	1164316	. TAPE ASSEMBLY-TILT	1	
- 91	1134817	. TAPE,ROTATE- 15 INCH MACHINE	1	
- 92	1134837	. SPRING-TILT PULL ARM	1	
- 94	1166779	. LINK-TILT PULL ARM	1	
- 95	1134878	. STUD, TILT ARM LINK	1	
- 96	1141084	. SPRING,COMPENSATOR STOP	1	
- 97	1135028	. LINKAGE-TILT ARM-EARLY STYLE	1	
- 97	1203214	. LINKAGE,TILT ARM-LATE STYLE	1	
		NOT ILLUSTRATED		
- 97A	1187001	. WASHER,ABSORBENT	1	
- 98	1203215	. LINKAGE,ROTATE ARM-LATE STYLE	1	
		NOT ILLUSTRATED		
- 98	1135029	. LINKAGE-ROTATE ARM-EARLY STYLE	1	
- 99	1135031	. BRACKET-SELN DIFF LEVER GUIDE	1	
-100	1135826	. NUT,SELF LOCKING- 2-56 X 0.275 WIDE HEX	1	
-101	1138462	. NUT, CR SHOE ADJ AND SEL PLATE MTG	3	
-102	1141075	. SPRING-COMP ASSIST	1	
-103	1203322	. SPRING-TILT ARM TORQUE	1	
-104	1144666	. BRACKET	1	
-106	1159157	. BAIL- 5 UNIT	1	
-107	1203556	. ARM ASM	1	
-109	1203446	. SPRING	1	
-110	1203255	. BELLCRANK ASSEMBLY-ROTATE	1	
-111	1159787	. SPRING	1	
-112	1159898	. SHAFT-BAIL	1	
-113	1164576	. SCREW	1	
-114	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
-115	1164580	. SCREW,MACH-BINDING HD 4-40 X 0.250 LG	1	
-116	1164775	. SCREW,PILOT- 0.080 DIA 0.469 LG 4-40 THD	1	
-117	1166560	. WICK-SELECTION BAIL	2	
-118	37913	. NUT-HEX 4-40 X .250 ID	1	
-119	38051	. NUT-FRICTION LATCH MOUNTING	1	
-120	438549	. SCREW,MACH-BIND HD 4-40 X 7/16 LG	1	
-121	1135079	. STOP, SELECTION BAIL	1	
-122	1187001	. LUBE WICK	1	
-123	1164089	. SCREW	1	
-124	1203289	. SHAFT,ROTATE ARM	1	
-125	1203298	. STUD,TILT ARM PIVOT	1	
-126	1203293	. ARM,ROTATE-SOLID (EARLY STYLE) USES 1164045,INDEX 84	1	
-126	1203218	. ARM,ROTATE-SOLID LATE STYLE-USES 1147182 INDEX 84	1	
-127	1203290	. BRACKET	1	
-128	1164579	. SCREW	1	
-129	1174160	. PULLEY	1	
-130	1141896	. SPACER	1	
-131	1187000	. LUBE WICK	1	
-132	1134842	. NUT	1	
-133	1203297	. GUARD	1	
-134	37913	. NUT	2	
-135	1092125	. RETAINER	1	
-136	37913	. NUT	1	
-137	1116312	. WASHER	2	
-139	1133669	. SPRING 11"	AR	
-139	1128055	. SPRING 15" AND 22"	AR	

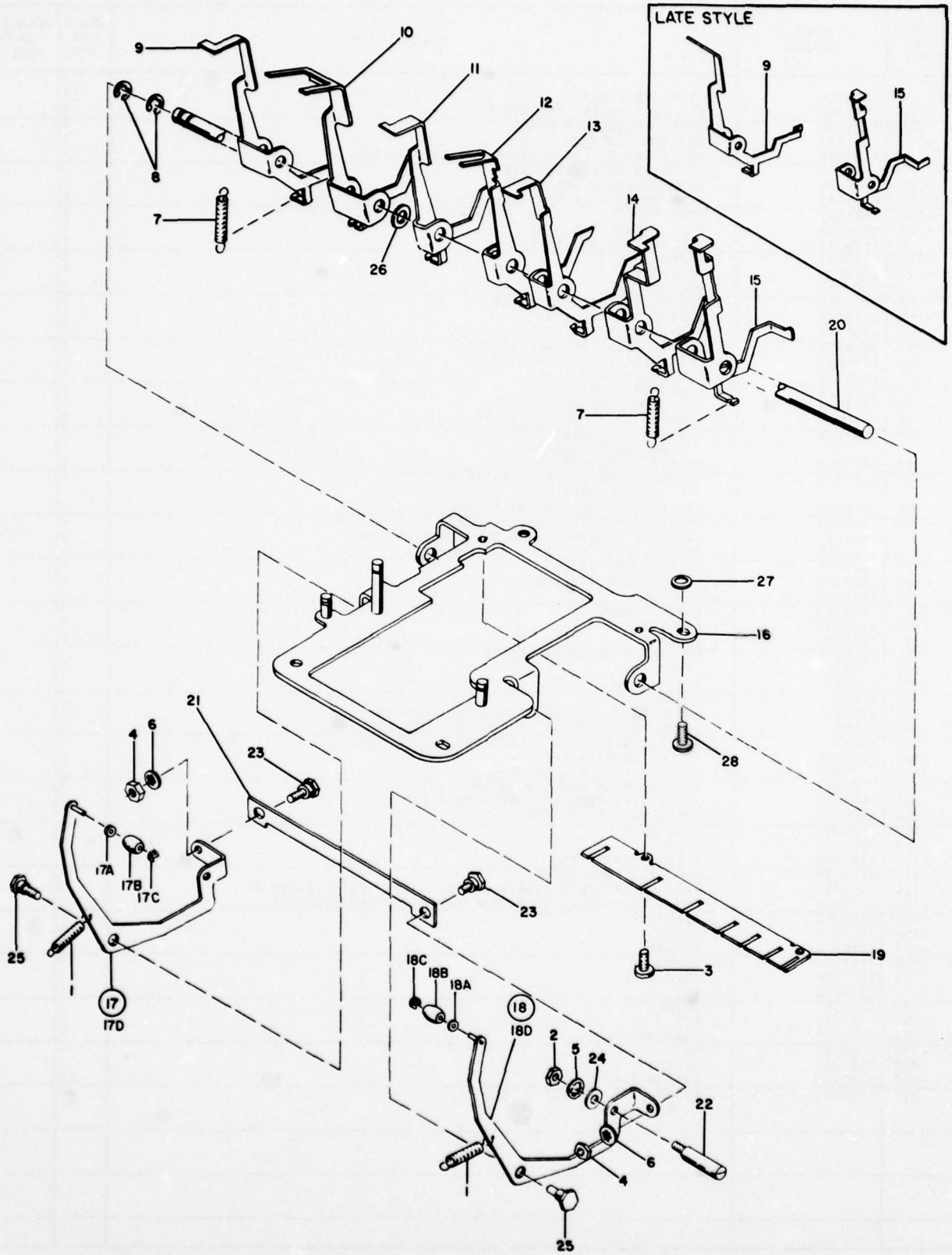
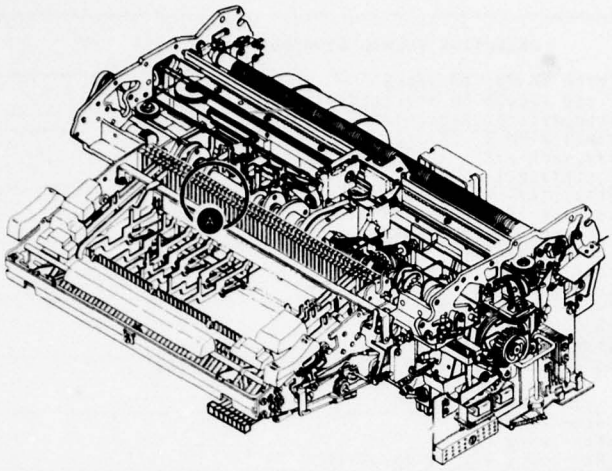


FIGURE 50. SELECTION PUSHER ASSEMBLY. SEE LIST 50.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		SELECTION PUSHER ASSEMBLY		
50 -	1203907	SELECTION PUSHER ASSEMBLY SEE FIGURE 50 FOR ILLUSTRATION	REF	
- 1	10514	. SPRING,HELICAL,EXTENSION- 20 TURNS	2	
- 2	37913	. NUT-HEX 4-40 X .250 ID	2	
- 3	38259	. SCREW,MACH-FIL H 4-40 X 1/8 LG	2	
- 4	47987	. NUT,PLAIN,HEX- 2-56 X 3/16 FL W	2	
- 5	150209	. WASHER,STAR- 0.115, 0.270 M	2	
- 6	358509	. WASHER,IK INT TOOTH 0.092 ID X 0.012 THK	2	
- 7	1090162	. SPRING,HELICAL,EXTENSION	7	
- 8	1092125	. RING-RETAINING	2	
- 9	1128605	. PUSHER-LATCH T2, EARLY STYLE	1	
- 9	1135379	. PUSHER,LATCH T2, LATE STYLE	1	
- 10	1128606	. PUSHER-CHECK LATCH	1	
- 11	1128607	. PUSHER-LATCH T1	1	
- 12	1128608	. PUSHER-LATCH R2A-EARLY STYLE	1	
- 12	1203906	. PUSHER-LATCH R2A-LATE STYLE-NOT ILLUSTRATED USED WITH LATE STYLE ROTATE LINKAGE FIGURE 49 INDEX 98	1	
- 13	1128609	. PUSHER-LATCH R1	1	
- 14	1128610	. PUSHER-LATCH R2	1	
- 15	1128611	. PUSHER-LATCH R5, EARLY STYLE	1	
- 15	1135378	. PUSHER,LATCH R5, LATE STYLE	1	
- 16	1128613	. PLATE ASSEMBLY-PUSHER	1	
- 17	1128616	. ARM ASSEMBLY-IH CAM FOLLOWER	1	
- 17A	1187416	. . LUBE WASHER	1	
- 17B	1128618	. . ROLLER	1	
- 17C	469565	. . RING, RETAINER	1	
- 17D	1187238	. . ARM ASM	1	
- 18	1128622	. ARM ASSEMBLY-RH CAM FOLLOWER	1	
- 18A	1187416	. . LUBE WASHER	1	
- 18B	1128618	. . ROLLER	1	
- 18C	469565	. . RING, RETAINER	1	
- 18D	1181240	. . ARM ASM	1	
- 19	1128623	. GUIDE-PUSHER	1	
- 20	1128624	. ROD-PUSHER LATCH	1	
- 21	1128625	. BAIL-PUSHER	1	
- 22	1128626	. ECCENTRIC-KNOCKOFF	2	
- 23	1128627	. SCREW-SPECIAL	2	
- 24	1135052	. SPACER	2	
- 25	1159155	. SCREW,SHLDR- 0.185 DIA 0.043 LG 4-48 THD	2	
- 26	1166770	. WICK-OIL	6	
- 27	1090840	WASHER	4	
- 28	1164577	SCREW,MACH-BINDING HD 6-32 X 0.312 LG	4	



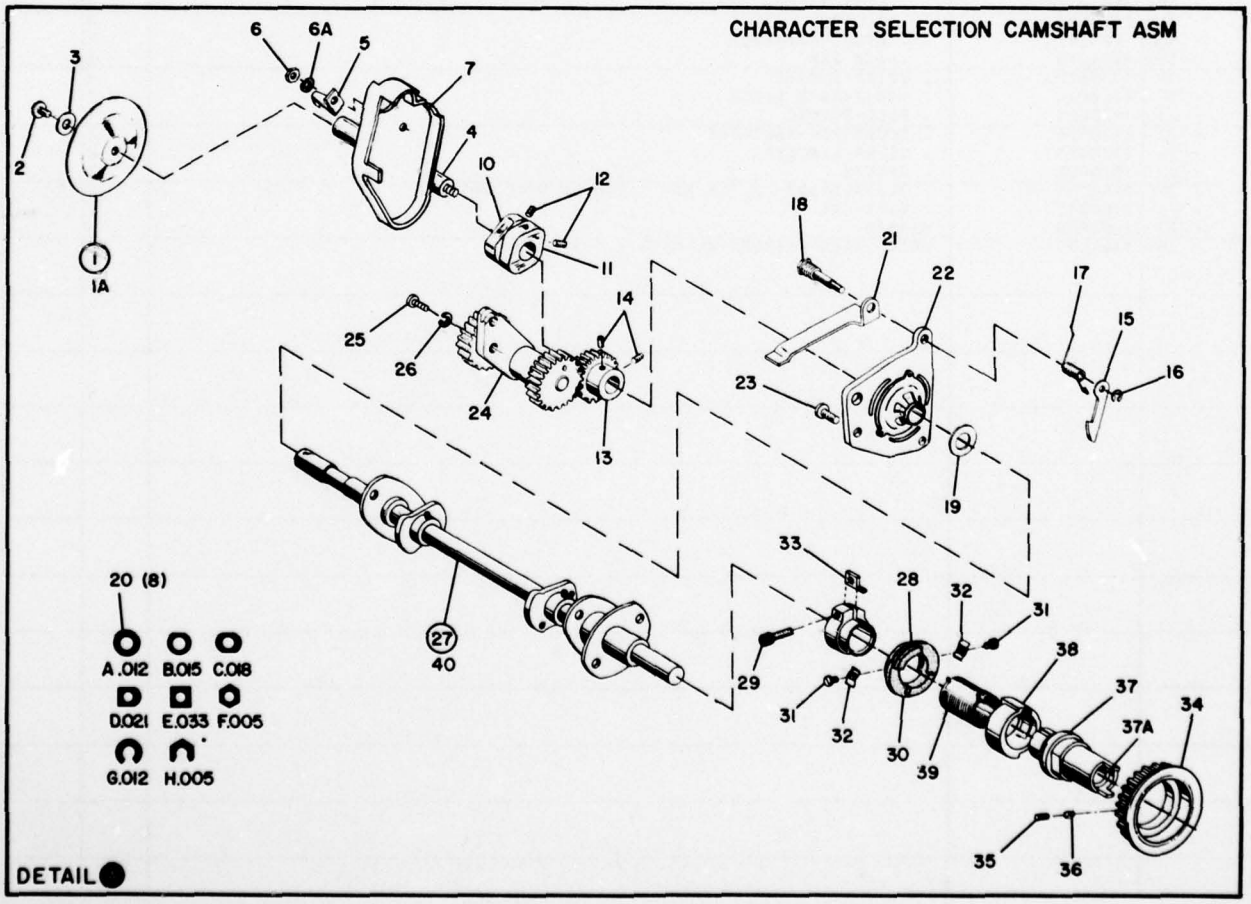


FIGURE 51. CHARACTER SELECTION CAMSHAFT ASM. SEE LIST 51.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		CHARACTER SELECTION CAMSHAFT ASM		
51 -	NO NO.	CHARACTER SELECTION CAMSHAFT ASM SEE FIGURE 51 FOR ILLUSTRATION	NP	
- 1	1272675	. INDEX DIAL FBM	1	
- 1A	1159953	. . DIAL,INDEX-CAM SHAFT	1	
- 2	1159994	. . SCREW	1	
- 3	1090254	. . WASHER,FLAT- 0.191 ID 0.438 OD 0.031 THK	1	
- 4	1166626	. . SHAFT-EXTENSION	1	
- 5	1135219	. POINTER, DIAL	1	
- 6	38051	. NUT-FRICTION LATCH MOUNTING	1	
- 6A	1090254	. WASHER,FLAT- 0.191 ID 0.438 OD 0.031 THK	1	
- 7	1135236	. GUARD-GEAR	1	
- 10	1135058	. CAM-NYLON C1	1	
- 11	1128839	. CAM-NYLON C2	1	
- 12	1128837	. SETSCREW-HEADLESS 2-56 X 0.156 LG	2	
- 13	1123685	. GEAR	1	
- 14	1175107	. SETSCREW	2	
- 15	1166315	. PAWL ASSEMBLY-CYCLE CAM STOP SEE NOTE AFTER INDEX 756	1	
- 16	1073418	. RING-RETAINING SEE NOTE AFTER INDEX 756	1	
- 17	1166598	. SPRING-CYCLE CLUTCH STOP PAWL SEE NOTE AFTER INDEX 756	1	
- 18	1166311	. STUD-CYCLE CLUTCH BELOW SN 4620572 REPLACEMENT OF ANY ONE OF INDEX NOS. 753 THRU 756 REQUIRES THE REPLACEMENT OF ALL	1	
- 19	1127730	. WASHER,FL- 0.375 ID X 0.015 THK	1	
- 20	1127753	. SHIM-CYCLE SHAFT A.012	AR	
- 20	1127754	. SHIM-CYCLE SHAFT B.015	AR	
- 20	1127755	. SHIM-CYCLE SHAFT C.018	AR	
- 20	1127756	. SHIM-CYCLE SHAFT D.021	AR	
- 20	1127757	. SHIM-CYCLE SHAFT E.033	AR	
- 20	1128071	. SHIM-CYCLE SHAFT F.005	AR	
- 20	1280821	. SHIM-CYCLE SHAFT G.012	AR	
- 20	1280822	. SHIM-CYCLE SHAFT H.005	AR	
- 21	1128259	. GUARD-GEAR 15 INCH MACHINE	1	
- 22	1175268	. BEARING ASSEMBLY	1	
- 23	35739	. SCREW,MACH-BIND HD 6-32 X 15/16 LG	1	
- 24	1128062	. IDLER ASSEMBLY	1	
- 25	1128356	. SCREW	2	
- 26	1090840	. WASHER	2	
- 27	1266830	. SHAFT ASSEMBLY-CAM FBM USED ON MACHINES BELOW SN 4622494	1	
- 27	1272914	. SHAFT ASSEMBLY-CAM FBM USED ON MACHINES ABOVE SN 4622494	1	
- 28	1135583	. . COLLAR ON MACH BELOW SN4622494 ORDER BM 1266830	1	
- 29	357820	. . SCREW,CAP,SOC HD- 4-40 X 1/2 LG	1	
- 30	1135995	. . CAM-CC LAT REST	1	
- 31	1138393	. . SCREW,MACH FIL H NO. 3-48 X 9/64	2	
- 32	1138392	. . CLAMP, RESTORING CAM	2	
- 33	1166558	. . INSERT-CYCLE CLUTCH COLLAR	1	
- 34	1166228	. . PULLEY ASM-CYCLE CLUTCH	1	
- 35	1166342	. . SETSCREW-FLUTED DR CUP PT 4-40 X 0.180LG	1	
- 36	1175102	. . SETSCREW-6 FLUTE DR 4-40 X 3/16 FLAT PT	1	
- 37	1187968	. . HUB ASM-CYCLE CLUTCH LARGE CTR BRG ON MACH BELOW SN4622494 ORDER BM 1266830	1	
- 37	1272913	. . HUB ASM, CYCLE CLUTCH, SMALL CENTER BEARING USE 1187968, INDEX 37 AND 1159669, INDEX 37A AS A REPLACEMENT.	1	
- 37A	1159669	. . SLEEVE	1	
- 38	1166553	. . SLEEVE-CYCLE CLUTCH	1	
- 39	1166551	. . SPRING-CYCLE CLUTCH ON MACH BELOW SN4622494 ORDER BM 1266830	1	
- 40	1166554	. . SHAFT ASSEMBLY-SELECTOR CAM ON MACH BELOW SN4622494 ORDER BM 1266830	1	

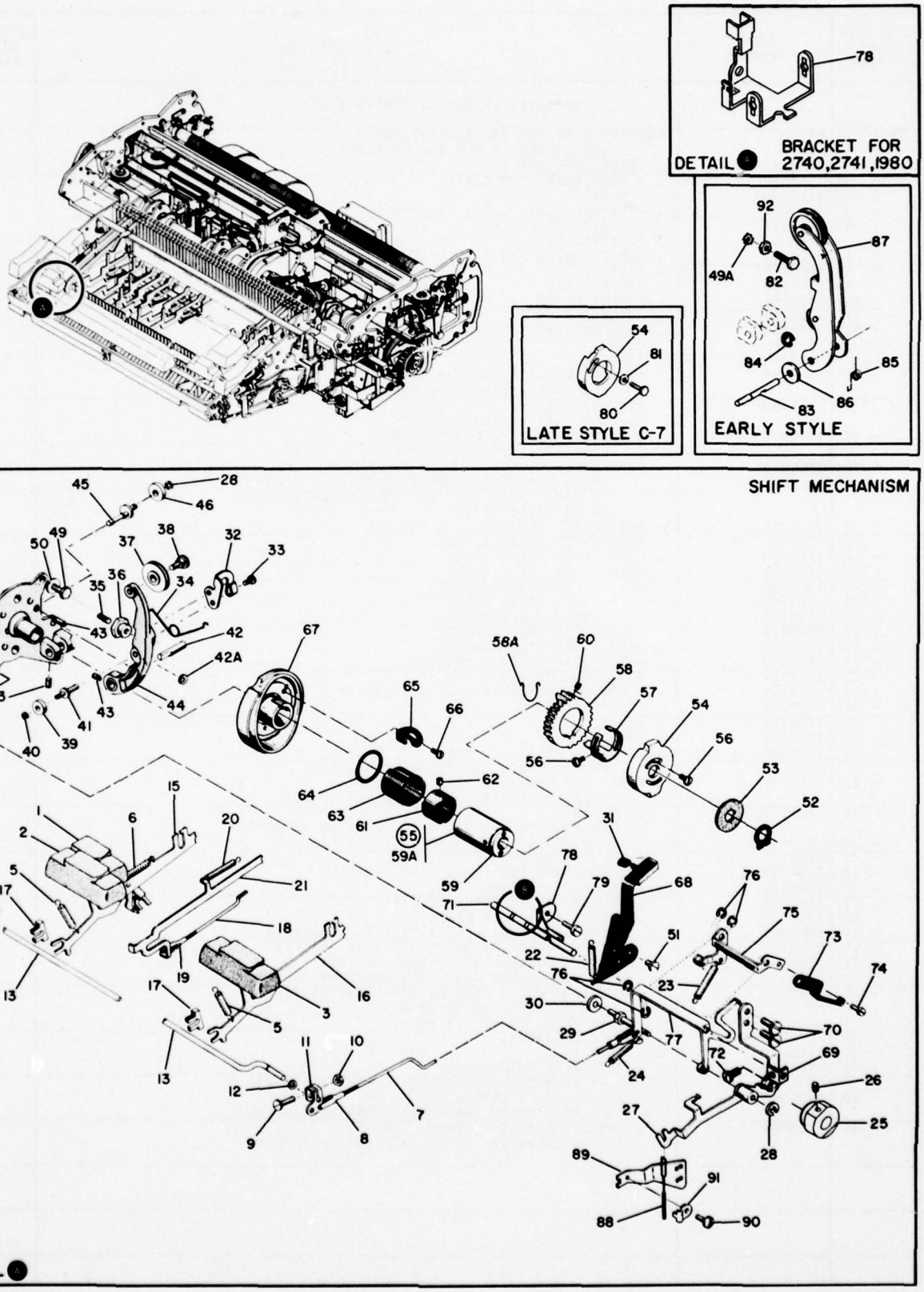


FIGURE 52. SHIFT MECHANISM. SEE LIST 52.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		SHIFT MECHANISM		
52 -		SHIFT MECHANISM	REF	
		SEE FIGURE 52 FOR ILLUSTRATION		
- 1	1127943	. KEYBUTTON,TYPEWRITER-ARROW DOWN LOCK	AR	
- 1	1132266	. KEYBUTTON,TYPEWRITER-SHIFT LOCK GRAY	AR	
- 1	1132270	. KEYBUTTON,TYPEWRITER-LOCK BLUE	AR	
- 1	1133810	. KEYBUTTON,TYPEWRITER-BLANK SHIFT LOCK	AR	
- 1	1187408	. KEYBUTTON,TYPEWRITER-L/C/M SHIFT LOCK	AR	
- 2	1127936	. KEYBUTTON,TYPEWRITER-LH SHIFT GRAY	AR	
- 2	1132259	. KEYBUTTON,TYPEWRITER-LH SHIFT GRAY	AR	
- 2	1132263	. KEYBUTTON,TYPEWRITER-LH SHIFT BLUE	AR	
- 2	1187410	. KEYBUTTON,TYPEWRITER-PMTS SHIFT LH SIDE	AR	
- 3	1127930	. KEYBUTTON,TYPEWRITER-RH SHIFT GRAY	AR	
- 3	1132252	. KEYBUTTON,TYPEWRITER-RH SHIFT GRAY	AR	
- 3	1132256	. KEYBUTTON,TYPEWRITER-RH SHIFT BLUE	AR	
- 3	1187412	. KEYBUTTON,TYPEWRITER-PMTS SHIFT RH SIDE	AR	
- 5	1071449	. SPRING,HELICAL,EXTENSION	1	
- 6	1074242	. SPRING,HELICAL,EXTENSION	1	
- 7	1128935	. LINK	1	
		USED ONLY ON MACHINES 1518		
- 7	1159895	. LINK	1	
		USED ON ALL MACHINES EXCEPT 1518		
- 8	1070020	. CLEVIS-LINK	1	
- 9	1928	. SCREW,MACH-RH 6-32 X 1/2 LG	1	
- 10	1134829	. NUT	1	
- 11	1124285	. CRANK	1	
- 12	1138455	. WASHER-SHIFT RAIL	1	
- 13	1132235	. RAIL	1	
- 14	1118361	. RING-GRIP	1	
- 15	1128871	. KEYLEVER-SHIFT LOCK	1	
- 16	1133672	. KEYLEVER-RH SHIFT	1	
- 17	1141269	. SLEEVE-LATE STYLE	2	
- 18	1135604	. LINK-LOCKOUT	1	
		USED ONLY ON MACHINES 1518		
- 19	1070020	. CLEVIS-LINK	1	
- 20	1107794	. SPRING,HELICAL,EXTENSION	1	
- 21	1128893	. INTERPOSER-SHIFT LATCH	1	
- 22	1147350	. SPRING-COIL	2	
- 23	1090162	. SPRING,HELICAL,EXTENSION	2	
- 24	1072703	. SPRING	2	
		USED ONLY ON MACHINES 1518		
- 24	79193	. SPRING-SHIFT RELEASE	2	
		USED ON ALL MACHINES EXCEPT 1518		
- 25	1187205	. CAM-SHIFT INTERLOCK	1	
- 26	1175107	. SETSCREW	2	
- 27	1176872	. ARM-PRINT INLK	1	
- 28	1073418	. RING-RETAINING	3	
- 29	1124697	. STUD, SHIFT DETENT ARM	1	
- 30	22066	. WASHER,FL- 0.140 ID 0.281 OD 0.025 THK	1	
- 31	1124773	. DAMPER, BRAKE ARM	1	
- 32	1128971	. TAB-ARM	1	
- 33	15887	. SCREW,MACH-BIND HD 2-56 X 1/8 LG	2	
- 34	1128471	. SPRING-SHIFT ARM	1	
- 35	1141215	. SETSCREW-FLUTED DR FLAT PT 4-40 X 5/8 LG	1	
- 36	1141030	. NUTSCREW-HEX HD	1	
- 37	1144979	. PULLEY-ROTATE RH	1	
- 38	1164577	. SCREW-ROTATE PULLEY RH	1	
- 39	1124259	. RCLLER-SHIFT CAM	1	
- 40	469656	. RING,RETAINING	1	
- 41	1159109	. SHAFT-ROLLER	1	
- 42	1124266	. PIN, PIVOT SHIFT ARM	1	
- 42A	1166770	. WICK,OIL	1	
- 43	1175103	. SETSCREW-6 FLUTE DR 6-32 X 1/8 CUP PT	4	
- 44	1124261	. ARM ASSEMBLY, SHIFT	1	
- 45	1123807	. ECCENTRIC, SHIFT CAM ROLL	1	
- 46	1166618	. RCLLER-SHIFT CAM ECCENTRIC	1	
- 48	1166368	. PLATE ASSEMBLY-SHIFT ARM MOUNTING	1	
- 49	1124775	. SCREW, SHIFT ARM STOP	1	
- 49	1164576	. SCREW	3	
		USED ON MACH. WITH IMPROVED LUBRICATION		
- 49A	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	1	
- 50	1090049	. SPACER-STOP SCREW	1	
- 51	1164576	. SCREW	2	
- 52	1133746	. RING, RETAINING, GRIP TYPE	1	
- 53	1166557	. WASHER-THRUST	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		USED WITH PN 1176990 ON 835 ONLY USED ON 835 ONLY		
52 - 54	1166367	. CAM C-7-EARLY STYLE	1	
- 54	117699C	. CAM,C-7-LATE STYLE	1	
- 55	1187662	. STOP ASSEMBLY-SHIFT CLUTCH	1	
- 56	1166363	. . SCREW,MACH-FLAT FIL H 4-40 X 0.219 LG	3	
- 57	116638C	. . STOP-SHIFT RATCHET	1	
- 58	1166385	. . RATCHET-SHIFT CLUTCH	1	
- 58	1187204	. . RATCHET-SHIFT CLUTCH USED ON MACH ABOVE SN 4643262	1	
- 58A	1187235	. . RETAINER-SHIFT CLUTCH USED ON MACH ABOVE SN 4643262	1	
- 59	1166377	. . HUB	1	
- 59A	118740C	. . SLEEVE	1	
- 60	1124836	. SCREW-TILT DETENT GUIDE	1	
- 61	1166362	. ARBOR-SHIFT CLUTCH	1	
- 62	1175103	. SETSCREW-6 FLUTE DR 6-32 X 1/8 CUP PT	1	
		USED ONLY ON MACHINES 1518		
- 62	328815	. SETSCREW-FLUTED SOC 6-32 X 1/8 CUP PT	1	
		USED ON ALL MACHINES EXCEPT 1518		
- 63	1166381	. SPRING-SHIFT CLUTCH	1	
- 64	1203271	. SEAL-RING SHIFT CAM	1	
- 65	1123810	. STOP, SHIFT CAM	1	
- 66	1164584	. SCREW,MACH-BINDING HD 4-40 X 0.149 LG	1	
- 67	1187203	. CAM-CAM SHIFT	1	
- 68	1128199	. BRAKE-SHIFT 15 INCH MACHINE	1	
- 69	1128189	. BRACKET-SHIFT SUPPORT	1	
- 70	1164576	. SCREW	2	
- 71	1128190	. SHAFT-RELEASE 15 INCH MACHINE	1	
- 72	1164690	. SCREW,MACH-BINDING HD 4-40 X 0.312 LG	1	
- 73	118720C	. ARM-SH INIK SPR	1	
		USED ON MACH ABOVE SN 4643262		
- 74	358174	. SCREW,MACH-PAN HD 2-56 X 0.105 LG	1	
- 75	1128192	. ARM ASSEMBLY- 15 INCH MACHINE	1	
- 76	264641	. RING,RETAINING-EXT 0.114 ID X 0.025 THK	4	
- 77	113532C	. *ARM-SHIFT RELEASE 15 INCH MACHINE*	1	
- 77	1187658	. ARM-SHIFT RELEASE 15 INCH MACHINE	1	
		USED ON MACH ABOVE SN 4643262		
- 78	112401C	. BRACKET	1	
- 78	1141147	. BRACKET, 2740,2741,1980	1	
- 79	1164582	. SCREW	2	
- 79	38351	. SCREW,MACH-FIL HD 6-32 X .312 LG	1	
- 80	1159262	. SCREW C-7 CAM	1	
- 81	257985	. WASHER,FLAT-NO. 4 X 0.250 OD X 0.028 THK	1	
- 82	1128356	. SCREW,MACH-HEX HD 6-32 X 0.560 LG	1	
- 83	1141992	. PIN-SHIFT ARM PIVOT	1	
- 84	1092125	. RING-RETAINING	1	
- 85	1128303	. SPRING-SHIFT ARM	1	
- 86	1090254	. WASHER,FLAT- 0.191 ID 0.438 OD 0.031 THK	1	
- 87	1144808	. ARM ASM-SHIFT	1	
- 88	1187539	. CABLE	1	
		USED ON ALL MACH. EXCEPT 1980 AND 2970		
- 89	1176885	. BRACKET-CLAMP MTG	1	
- 90	1164578	. SCREW,MACH-BINDING HD 4-40 X 0.125 LG	1	
- 91	1176884	. CLAMP	1	
- 92	38051	. NUT	1	

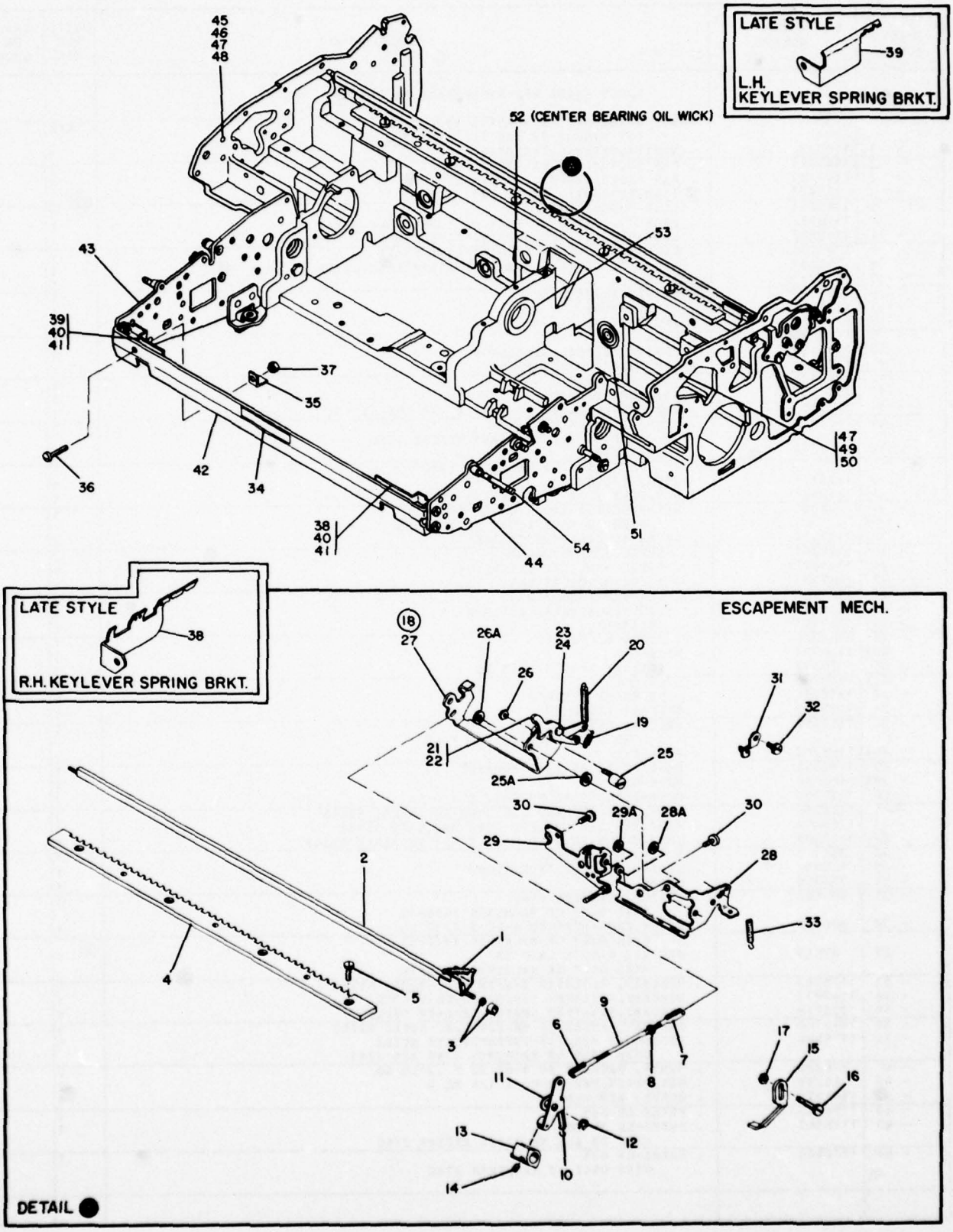


FIGURE 53. POWER FRAME AND ESCAPEMENT MECHANISM. SEE FIGURE 53.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		POWER FRAME AND ESCAPEMENT MECHANISM		
53 -		POWER FRAME AND ESCAPEMENT MECHANISM SEE FIGURE 53 FOR ILLUSTRATION	REF	
- 1	1100936	. SPRING,HELICAL,EXTENSION	1	
- 2	1147385	. BAR ASSEMBLY-ESCAPEMENT TORQUE	1	
- 2	1147387	. BAR ASSEMBLY-ESC. TORQUE-2970	1	
- 3	219633	. RING,RETAINING-EXT 0.073 ID X 0.015 THK	1	
- 3	1141223	. CLIP-TORQUE BAR	3	
- 4	1128032	. RACK- 10 PITCH 15 INCH MACHINE-EARLY STYLE	1	
- 4	1203588	. RACK,10P 15 INCH MACHINE-LATE STYLE	1	
- 4	1203589	. RACK,12P 15 INCH MACHINE-LATE STYLE	1	
- 4	1128037	. RACK- 12 PITCH 15 INCH MACHINE-EARLY STYLE	1	
- 5	1132713	. SCREW	6	
- 6	1127727	. CLEVIS-ADJUSTABLE	1	
- 7	1110529	. CLEVIS-LINK	1	
- 8	1127728	. NUT, EEX NO.4	1	
- 9	1123831	. LINK	1	
- 10	1090162	. SPRING,HELICAL,EXTENSION	1	
- 11	1123591	. CAM FOLLOWER ASSEMBLY	1	
- 12	1092125	. RING-RETAINING	1	
- 13	1138452	. CAM, ESCAPEMENT	1	
- 14	1175103	. SETSCREW-6 FLUTE DR 6-32 X 1/8 CUP PT	1	
- 15	1128204	. STOP, TRIGGER USED ON ALL MACHINES EXCEPT 1980	1	
- 15	1187294	. STOP-TRIGGER USED ONLY ON MACHINES 1980	1	
- 16	1128113	. STUD, TRIGGER	1	
- 17	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL W	1	
- 17	38051	. NUT-FRICTION LATCH MOUNTING USED ON MACH ABOVE SN 4633895	1	
- 18	1187230	. LEVER ASSEMBLY-SB TRIGGER	1	
- 19	1138795	. . SPRING, SB TRIGGER	1	
- 20	1141073	. . SPRING-HELICAL EXTENSION	1	
- 21	1187231	. . TRIGGER-TORQUE BAR	1	
- 22	1187233	. . TRIGGER-TORQUE BAR	1	
- 23	1187449	. . STUD-ESCAPEMENT TRIGGER	1	
- 24	1141141	. . RETAINER	1	
- 25	1128226	. . SCREW-ECCENTRIC	1	
- 25A	1166761	. WICK-OIL	1	
- 26	37913	. . NUT-HEX 4-40 X .250 ID	1	
- 26A	1166765	. WICK-OIL	1	
- 27	1187234	. . LEVER-SB TRIGGER	1	
- 28	1159338	. BRACKET-LATCH RH	1	
- 28	1187293	. BRACKET-LATCH RH USED ONLY ON MACHINES 1980	1	
- 28A	1166762	. WICK-OIL	1	
- 29	1135314	. BRACKET-LH 15 INCH MACHINE	1	
- 29A	1166761	. WICK-OIL	1	
- 30	1127733	. SCREW,MACH-SLTD HD 6-32 X 1/4 LG	2	
- 31	1128216	. STOP, TAB LEV AND ESC TORQ BAR,EARLY STYLE	1	
- 31	1203373	. STOP,TAB LEV AND ESC TORQ BAR,LATE STYLE	1	
- 32	1127733	. SCREW,MACH-SLTD HD 6-32 X 1/4 LG,EARLY STYLE	1	
- 32	186427	. SCREW,LATE STYLE	1	
- 33	123491	. SPRING,HELICAL,EXTENSION	1	
- 34	737858	. LABEL	1	
- 35	203660	. SWITCH, STACKER STOP USED ONLY ON MACHINES 1980-12	1	
- 36	438548	. SCREW,MACH-BIND HD 4-40 X 3/16 LG USED ONLY ON MACHINES 1980-12	1	
- 37	37913	. NUT-HEX 4-40 X .250 ID USED ONLY ON MACHINES 1980-12	1	
- 38	1135163	. BRACKET, KEYLEVER SPRING R.H.-EARLY STYLE	1	
- 38	1187873	. BRACKET,KEYLEVER SPRING-RH-LATE STYLE	1	
- 39	1203228	. BRACKET,KEYLEVER SPRING-LH-LATE STYLE	1	
- 39	1135164	. BRACKET, KEYLEVER SPRING L.H.-EARLY STYLE	1	
- 39	1176904	. ANCHOR-LH 835/935-INTERMEDIATE STYLE USED ONLY ON MACHINES 2740 AND 2741	1	
- 40	338238	. SCREW, MACH-BD HD 4-40 NC X .3125 LG	2	
- 41	38214	. NUT,PLAIN,HEX- 4-40 X 1/4 FL W	2	
- 42	1141226	. GUARD, KEYLEVER	1	
- 43	1176859	. FRAME-LH 835	1	
- 43	1135347	. FRAME-LH 15 IN. USED ON ALL MACHINES EXCEPT 2740	1	
- 44	1176860	. FRAME-RH 835 USED ONLY ON MACHINES 2740	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
53 - 44	1135346	. FRAME-RH 15 IN. USED ONLY ON MACHINES 1518	1	
- 44	1176515	. FRAME-RH USED ON ALL MACH. EXCEPT 2740 AND 1518	1	
- 45	1135592	. SCREW USED WITH BEARING PLATE PN 1135590	1	
- 46	1132185	. ECCENTRIC USED ONLY ON MACHINES 2740	1	
- 47	38051	. NUT-FRICTION LATCH MOUNTING	1	
- 48	6364	. WASHER,LOCK-SPLIT NO. 6 X 1/4 OD	1	
- 49	1135593	. STUD-PULLEY BRACKET MOUNTING LH	1	
- 50	1074145	. WASHER,FLAT-NO. 6	1	
- 51	1124506	. BEARING, ESCAPEMENT SHAFT USED ONLY ON MACHINES 2740 AND 2741	1	
- 51	1145359	. BEARING-ESCAPEMENT SHAFT USED ON ALL MACH. EXCEPT 2740 AND 2741	1	
- 52	1132147	. WICK, CAMSHAFT BRG OIL	1	
- 53	1203726	. BEARING,CENTER-SMALL	1	
- 53	1203727	. BEARING,CENTER-LARGE	1	
- 54	1203582	. STUD-(FIELD REPLACEMENT ONLY) NOTE: FACTORY INSTALLED STUD IS PRESSED INTO SIDE FRAME. FIELD REPLACEABLE STUD IS THREADED.	1	

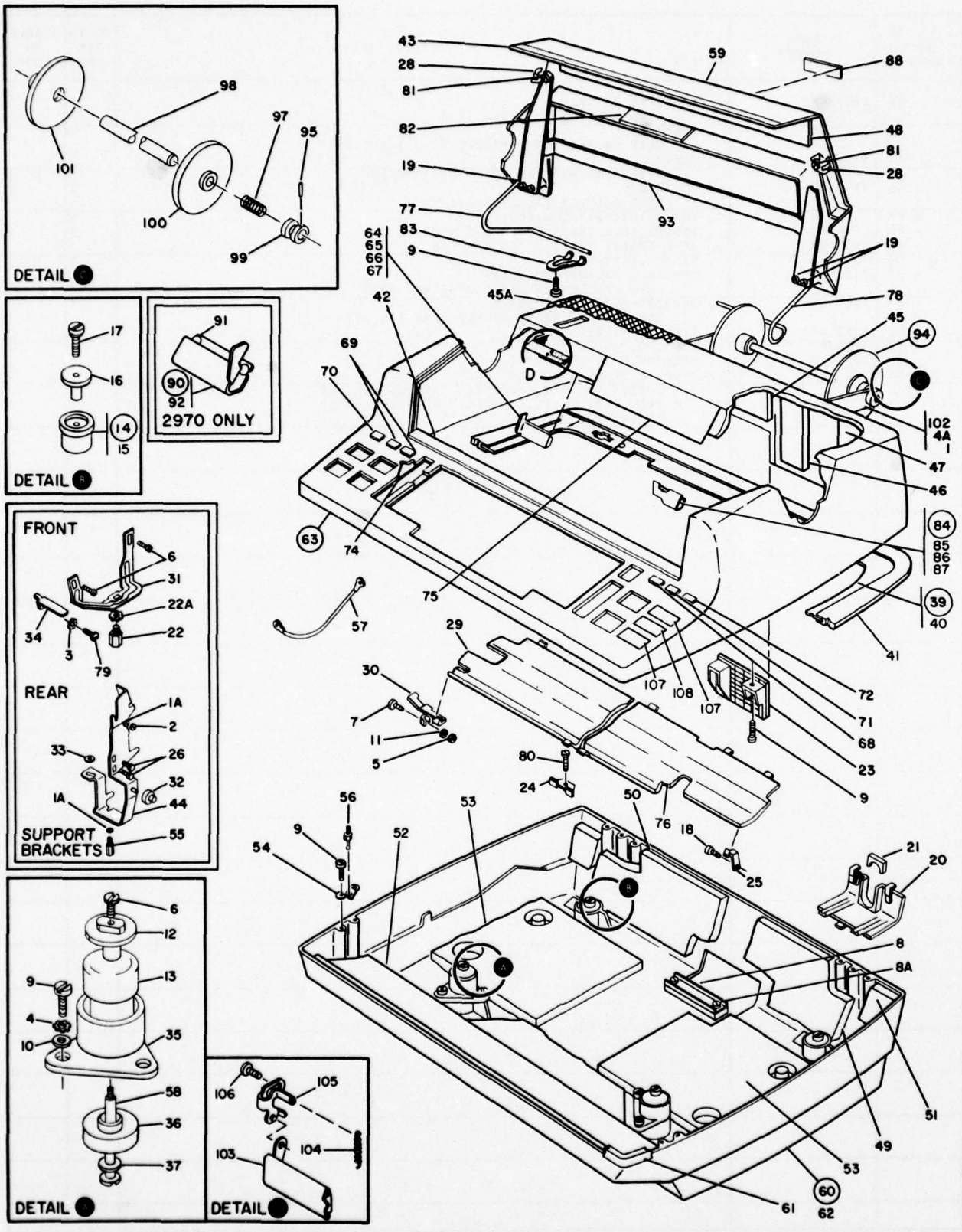


FIGURE 54. TILT UP COVER ASSEMBLIES. SHEET 1 OF 2. SEE LIST 54.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		TILT UP COVER ASSEMBLIES		
54 -		CODE A USED ONLY ON MACHINES 2740 CODE B USED ONLY ON MACHINES 2741		
		CODE C USED ONLY ON MACHINES 1518 CODE D USED ONLY ON MACHINES 1980 CODE E USED ONLY ON MACHINES 2970		
-	NO NO.	COVER ASSEMBLIES-TILT UP SEE FIGURE 54 FOR ILLUSTRATION	NP	
- 1	2994	. SCREW-MACH,FIL H,NO. 10-32 X .625 LG	4	
- 1A	3550	. WASHER,FL- 1/4 X 9/16 OD X 0.050 THK	4	
- 2	396C	. NUT,PLAIN,HEX- 1/4-20 X 7/16 FL W	2	
- 3	6364	. WASHER,LOCK-SPLIT NO. 6 X 1/4 OD	2	C
- 4	56722	. LOCKWASHER-EXT. TOOTH OD. .150XID. .320	1	
- 4A	12593C	. WASHER	4	E
- 5	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL W	1	
- 6	311642	. SCREW ASSEMBLED WASHER-8-32 X 0.360 LG	8	
- 7	322551	. SCREW,MACH-BIND HD 6-32X3/4 LG	1	
- 8	1176707	. BRACKET-CABLE CLAMP	1	
- 8A	1164579	. SCREW,MACH-BIND HD 6-32 X 0.375 LG	2	
- 9	811421	. SCREW-PAN HD 6-32X.500 LG	9	
		USED ON ALL MACHINES EXCEPT 2741		
- 9	1154084	. SCREW	9	B
- 10	1090622	. WASHER,FLAT- 0.145 ID 0.375 OD 0.040 THK	4	
- 11	109097C	. WASHER,FL-NO. 6 X 3/8 OD X 0.020 THK	1	
- 12	1116930	. INSERT-FRONT FOOT	2	
- 13	1117391	. MOUNT,RUBBER	2	
- 14	1117865	. FOOT ASSEMBLY-CASE REAR	2	
- 15	1117391	. . MOUNT,RUBBER	1	
- 16	1117641	. . INSERT-REAR FOOT METAL	1	
- 17	1154336	. . SCREW	1	
- 18	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	1	
- 19	1124084	. SCREW	4	
- 20	1135248	. GROMMET-BOT COVER	1	
		USED ONLY ON CODES A, B, C AND E		
- 20	1187584	. GROMMET-BOTTOM COVER	1	D
- 21	1135363	. INSERT-GROMMET	1	
- 22	1135491	. LEG-FRAME RING MOUNTED	2	
- 22A	76574	. LOCKWASHER-EXT TOOTH ID .267 X OD .510	2	
- 23	1135739	. VENT-GRAY	1	
		USED ONLY ON CODES A, B AND E		
- 23	1135740	. VENT-BLUE	1	
		USED ONLY ON CODES C AND D		
- 24	1141897	. CLIP-DUST SHIELD	1	
- 25	1141051	. CLIP, DUST SHIELD R.H.	1	
- 26	1141136	. SCREW	4	
- 28	1141520	. LATCH-COVER	2	
- 29	1141649	. SHIELD-LH 15 IN.	1	
- 30	1141837	. CLIP-LH 15 IN. & 767	1	
- 31	1159553	. BRACKET-RH FRONT	1	
		USED ON RH FRONT OF MACHINES ONLY		
- 31	1159554	. BRACKET-LH FRONT	1	
		USED ON LH FRONT OF MACHINES ONLY		
- 32	1159557	. ROLLER- 15 IN.	2	
- 33	1159560	. SPACER-RING MTG	2	D
- 33	1159560	. SPACER-RING MTG	2	E
- 34	1159561	. HANDLE	2	C
- 35	1159562	. MOUNT,SHOCK-FRONT	2	
- 36	1159565	. FOOT	4	
- 37	1159567	. WASHER-FRONT FOOT	4	
		USED ON FRONT OF ALL MACHINES USED ONLY ON REAR FEET OF 2740 AND 1518		
- 39	1159571	. RING ASM- 15 INCH	1	A
- 39	1159571	. RING ASM- 15 INCH	1	E
- 40	1159572	. . RING- 15 INCH	1	
- 41	1159573	. . GASKET- 15 INCH	1	
- 42	115957E	. TRIM- 15 INCH	1	
- 43	1159581	. SCALE- 10P 15 IN.	1	
- 43	1159582	. SCALE- 12P 15 IN.	1	
- 44	1159584	. BRACKET-LH REAR 15 IN.	1	
		USED ONLY ON LH REAR OF MACHINES CODED A, B, C AND E		
- 44	1135999	. BRACKET-LH REAR 15 IN.	1	D
		USED ONLY ON LH REAR OF MACHINES		

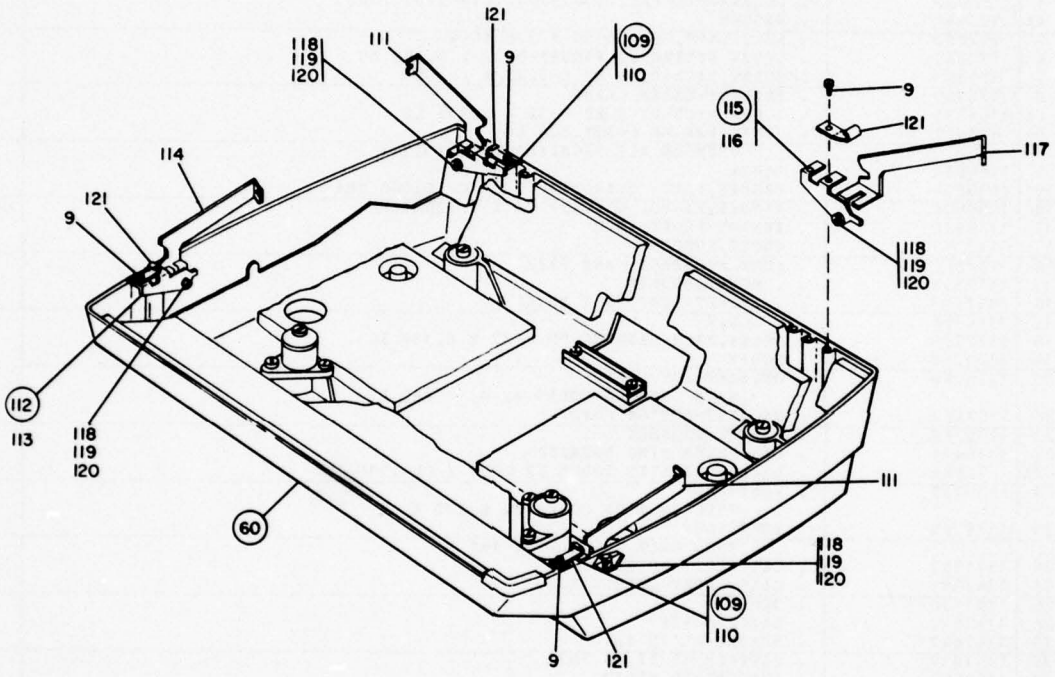


FIGURE 54. TILT UP COVER ASSEMBLIES. SHEET 2 OF 2. SEE LIST 54.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
54 - 44	1159585	. BRACKET-RH REAR USED ONLY ON RH REAR OF MACHINES CODED A, B, C AND E	1	
- 44	1135749	. BRACKET-RH REAR USED ONLY ON RH REAR OF MACHINES	1	D
- 45	1159593	. INSULATION-REAR COVER RH	1	
- 45A	1135433	. COVER-DUST	1	
- 45A	1187509	. DUST COVER-1980-9 AND 12	1	D
- 46	1159594	. INSULATION	2	
- 47	1159596	. INSULATION- 15 IN. USED ONLY ON CODES A, B, C AND E	2	
- 47	1135078	. INSULATION-CENTER COVER	2	D
- 48	1159598	. INSULATION- 15 IN.	1	
- 49	1159627	. INSULATION	1	
- 50	1159626	. INSULATION	1	
- 51	1159628	. INSULATION- 15 IN.	2	
- 52	1159629	. INSULATION- 15 IN.	1	
- 53	1159630	. INSULATION- 15 IN.	2	
- 54	1159632	. CATCH	4	
- 55	1159634	. LEG-REAR RING MTG USED ONLY ON CODES A, B, D AND E	2	
- 55	1159633	. LEG-REAR FREE STANDING	2	C
- 56	1159635	. STUD-BALL USED ONLY ON CODES A, B, D AND E	4	
- 56	1135118	. STUD-BALL	4	C
- 57	1159636	. GRND WIRE-BOT CVR SEE LIST 52-1A AND -3B FOR COMPONENT PARTS	1	
- 58	1159651	. SCREW-REAR FOOT USED ON REAR FEET ONLY	2	
- 58	1159652	. SCREW-FRONT FOOT USED ON FRONT FEET ONLY	2	
- 59	1159754	. COVER-TOP 15 IN.	1	C
- 59	1176950	. COVER-TOP 15 IN.	1	
- 59	1187986	. COVER,TOP-INTERMEDIATE STYLE DOC. INSERT.	1	D
- 59	1203874	. COVER,TOP-LATE STYLE DOCUMENT INSERTION USED ONLY ON CODES A, B AND E	1	D
- 59	1187296	. COVER-TOP 15 IN.	1	D
- 60	1159756	. COVER-BOTTOM	1	C
- 60	1176943	. COVER ASM-BOTTOM USED ONLY ON CODES A, B, D AND E	1	
- 61	1159573	. . GASKET- 15 INCH USED ONLY ON ASM 1176943	AR	
- 62	1176952	. . COVER-BOTTOM USED ONLY ON ASM 1176943	1	
- 63	1159761	. COVER-CENTER	1	B
- 63	1187621	. COVER-CENTER OTHER THAN AS ILLUSTRATED-NO BUTTON AND LIGHT HOLES ON 2741 AND 1518	1	C
- 63	1176951	. COVER-CENTER	1	A
- 63	1277212	. COVER-CENTER OTHER THAN AS ILLUSTRATED-BUTTON AND LIGHT HOLE CONFIGURATION ACCEPTS ITEMS ILLUSTRATED IN FIG. 55 FOR 2740 AND 2970	1	E
- 63	1187778	. COVER ASM. 2740-2 7.38 INCH	1	
- 63	1187767	. COVER ASM. 2740-2 6.00 INCH	1	
- 63	1187297	. COVER-CENTER-1980	1	
- 64	1164666	. . GAGE ASM-TAPE AND PAPER TABLE USED ALSO ON OTHER MACHINES	1	
- 65	1128282	. . . TAPE-PAPER GUIDE	AR	
- 66	1132248	. . . GAGE-PAPER TABLE	1	
- 67	1134801	. . . STUD-PAPER GAGE	2	
- 68	1187263	. . LENS-READY MODE	1	
- 69	1187264	. . LENS-BLANK	2	
- 70	1187265	. . LENS-OFF LINE MODE	1	
- 70	1187760	. . LENS,PLATEN SPLIT 2740-2	1	
- 71	1187266	. . LENS-TRANSMIT MODE	1	
- 71	1187762	. . LENS,TRANSMIT MODE 2740-2	1	
- 72	1187267	. . LENS-RECEIVE MODE	1	
- 72	1187763	. . LENS,REC. MODE, 2740-2	1	
- 74	1187300	. . SHIELD-INDICATOR LIGHTS	1	
- 75	1187370	. . GUIDE-LEDGER CARD USED ONLY ON 1980-9 ASM 1187244	1	
- 75	1187493	. . GUIDE-LEDGER CARD USED ONLY ON 1980-12 ASM 1187494	1	
- 76	1159936	. SHIELD-DUST RH	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
54 - 77	1164101	. HINGE-LH	1	
- 78	1164102	. HINGE-RH	1	
- 79	38348	. SCREW,MACH-FIL H 6-32 X 3/16 LG	2	C
- 80	1164580	. SCREW,MACH-BINDING HD 4-40 X 0.250 LG	1	
- 81	1164582	. SCREW	2	
- 82	1166099	. SIGN-SAFETY	1	
- 83	1166191	. CENTER AND TOP COVER-BRACKET-HINGE	2	
- 84	1176856 NP	. BRACKET ASSEMBLY-PAPER SWITCH		A
- 85	1128282	. . TAPE-PAPER GUIDE	AR	
- 86	1134801	. . STUD-PAPER GAGE	2	
- 87	1176857	. . PAPER SWITCH LOCKOUT	1	
- 88	1173945	. DECAL- 835	1	A
- 88	1176988	. DECAL- 935	1	B
- 88	1187255	. NAMEPLATE- 1980	1	D
- 88	1277113	NAMEPLATE-2970-1	1	E
- 90	1127202 NP	. GAGE ASM-RH PAPER TABLE		E
- 91	1134801	. . STUD-PAPER GAGE	2	
- 92	1277189	. . GAGE-PAPER TABLE RH	1	
- 93	1277203	. BRACKET-TEAR OFF	1	E
- 94	1203178	. ROLL HOLDER ASM	1	E
- 95	1109824	. . PIN,SPRING- 0.101 X 0.750 LG	1	
- 97	1277192	. . SPRING	2	
- 98	1277197	. . SHAFT	2	
- 99	1277198	. . LOCK	2	
-100	1203177	. . DISK ASSEMBLY-RH	2	
-101	1203179	. . DISK ASSEMBLY-LH	2	
-102	1277208	. BRACKET	1	E
-103	1128265	. PAPER TABLE- 10P USED ON ALL MACHINES EXCEPT 1518	1	
-103	1164666	. PAPER TABLE	1	C
-104	1128231	. SPRING-PAPER TABLE	2	
-105	1141925	. BRACKET-PAPER TABLE MTG LH	1	
-105	1141924	. BRACKET-PAPER TABLE MTG RH OPPOSITE AS ILLUSTRATED	1	
-106	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
-107	1187764	. LENS,WHITE, 835 MOD 2	2	
-108	1187765	. LENS,RED, 835 MOD 2	1	
-109	1186016	. LATCH ASM,COVER-WTC 2740-1,2741 & 1980-9,12	2	
-110	1186017	. . BRACKET,LATCH MTG-WTC	1	
-111	1186018	. . LEVER,COVER LATCH-WTC	1	
-112	1203488	. LATCH ASM,COVER-WTC 2740-2	1	
-113	1203492	. . BRACKET,LATCH MTG-WTC	1	
-114	1203490	. . LEVER,COVER LATCH-WTC	1	
-115	1203489	. LATCH ASM,COVER-WTC 2740-2 & 1980-9,12	1	
-116	1203492	. . BRACKET,LATCH MTG-WTC	1	
-117	1203491	. . LEVER,COVER LATCH-WTC	1	
-118	1105663	. SCREW,LEVER MTG-WTC	1	
-119	1090073	. NUT,LEVER MTG-WTC	1	
-120	56722	. WASHER,LOCK-WTC	1	
-121	1186020	. CLIP,COVER LATCH-WTC	1	

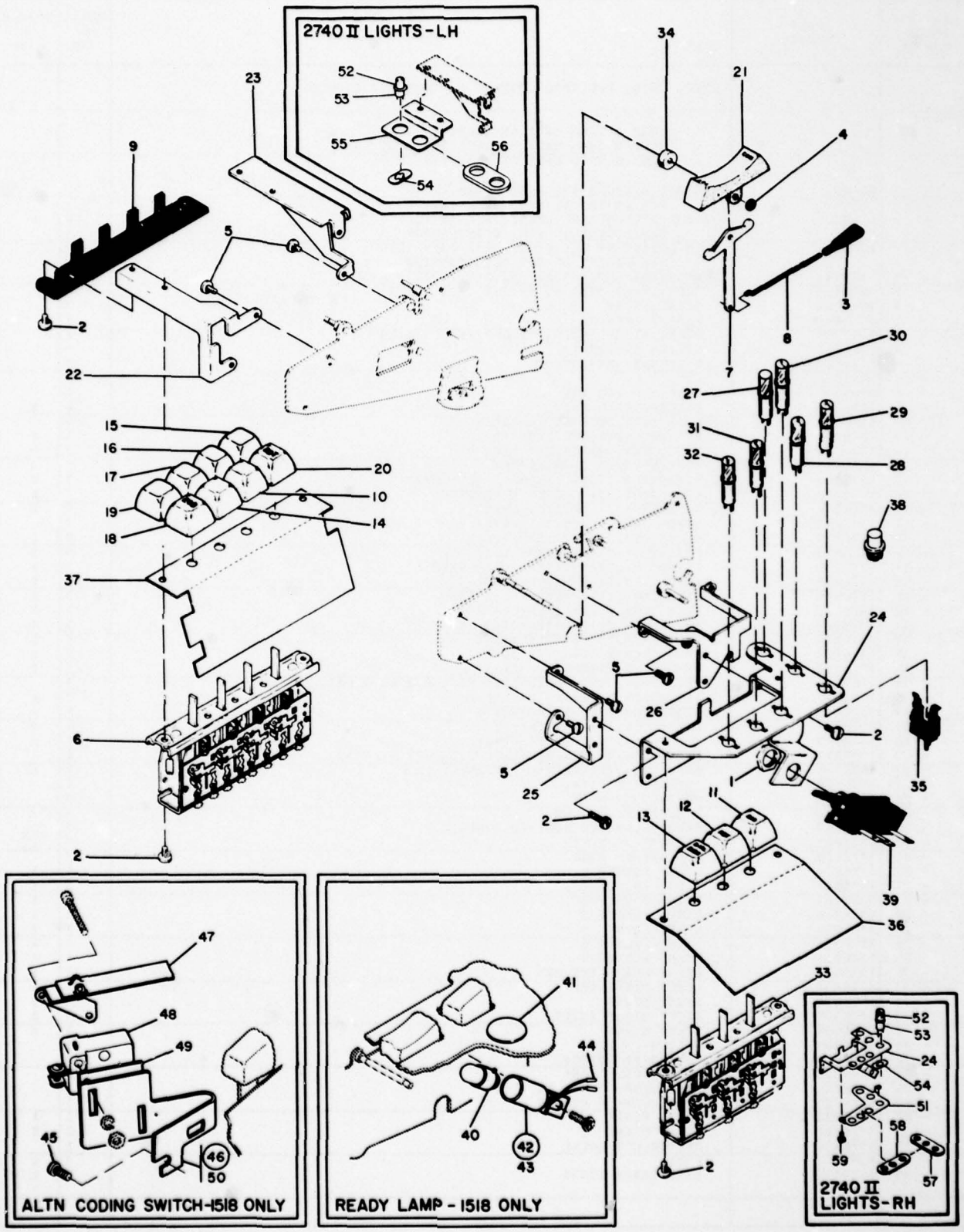


FIGURE 55. 2740,2970 AND 1518 CONTROI BUTTONS AND LIGHTS. SEE LIST 55.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		2740, 2970, AND 1518 CONTROL BUTTONS AND LIGHTS		
55 -		CODE A USED ONLY ON MACHINES 2740 CODE B USED ONLY ON MACHINES 2970 CODE C USED ONLY ON MACHINES 1518		
-	NO NO.	CONTROL BUTTONS AND LIGHTS ASM- 2740	NP	A
-	NO NO.	SEE FIGURE 55 FOR ILLUSTRATION CONTROL BUTTONS AND LIGHTS ASM- 2970 SEE FIGURE 55 FOR ILLUSTRATION	NP	B
-	NO NO.	ALTN CODING SW AND READY LAMP GRP- 1518 SEE FIGURE 55 FOR ILLUSTRATION	NP	C
- 1	179743	. NUT,PLAIN,HEX- 15/32-32 X 9/16 FL W	1	
- 2	438566	. SCREW,MACH-BIND HD 6-32 X .125 LG	10	
- 3	1070020	. CLEVIS-LINK	1	
- 4	1073418	. RING-RETAINING	1	
- 5	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	9	
- 6	1119359	. SWITCH ASSEMBLY	1	
- 7	1123520	. BELLCRANK-KEYBUTTON	1	
- 8	1133520	. LINK	1	
- 9	1144916	. BRACKET-DEAD KEY	1	
- 9	1186099	. BRACKET-DEAD KEY	2	B
- 10	1176813	. KEYBUTTON,TYPEWRITER-BLANK	8	
- 11	1176814	. KEYBUTTON,TYPEWRITER-EID	1	A
- 11	1277187	. KEYBUTTON,TYPEWRITER-SEND RED	1	B
- 12	1176815	. KEYBUTTON,TYPEWRITER-RST	1	A
- 12	1277107	. KEYBUTTON,TYPEWRITER-LTS TEST GRAY	1	B
- 13	1176816	. KEYBUTTON,TYPEWRITER-DIAL DISC	1	A
- 13	1277188	. KEYBUTTON,TYPEWRITER-ERROR	1	B
- 13	1187221	. KEYBUTTON,TYPEWRITER-ENTER-2740-2 ONLY	1	
- 14	1176817	. KEYBUTTON,TYPEWRITER-CANCEL	1	A
- 14	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 15	1176818	. KEYBUTTON,TYPEWRITER-TOTAL SKIP	1	A
- 15	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 16	1176819	. KEYBUTTON,TYPEWRITER-FORM FEED	1	A
- 16	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 17	1176820	. KEYBUTTON,TYPEWRITER-VERT TAB	1	A
- 17	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 18	1176821	. KEYBUTTON,TYPEWRITER-EOB	1	A
- 18	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 18	1187220	. KEYBUTTON,TYPEWRITER-LINE RETURN-2740-2 ONLY	1	
- 19	1176822	. KEYBUTTON,TYPEWRITER-PREFIX	1	A
- 19	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 20	1176823	. KEYBUTTON,TYPEWRITER-EOT	1	A
- 20	1176813	. KEYBUTTON,TYPEWRITER-BLANK	1	B
- 20	1187219	. KEYBUTTON,TYPEWRITER-LINE TYPE-2740-2 ONLY	1	
- 21	1176825	. KEYBUTTON,TYPEWRITER-COM. LCL	1	B
- 22	1176826	. SUPPORT-LH FRONT	1	
- 23	1176829	. SUPPORT-LH REAR	1	
- 24	1176830	. BRACKET-SWITCH RH	1	
- 24	1187777	. BRACKET,SWITCH MTG.-RH-2740-2	1	
- 25	1176831	. SUPPORT-RH FRONT	1	
- 26	1176832	. SUPPORT-RH REAR	1	
- 27	1176834	. LIGHT LETTER S	1	A
- 27	1186024	. LIGHT LETTER E	1	A
- 27	1277207	. LIGHT BLANK RED	1	B
- 28	1176835	. LIGHT LETTER T	1	A
- 28	1186022	. LIGHT LETTER S	1	A
- 29	1176836	. LIGHT LETTER R	1	A
- 29	1186023	. LIGHT LETTER E	1	A
- 30	1176837	. LIGHT BLANK YELLOW	1	B
- 31	1176838	. LIGHT BLANK RED	1	A
- 31	1176928	. LIGHT BLANK	1	B
- 32	1176839	. LIGHT BLANK WHITE	1	A
- 32	1176928	. LIGHT BLANK	1	B
- 33	1176841	. SWITCH- 3 POS	1	
- 34	1176864	. SPACER-KEYBUTTON	1	
- 35	1176925	. RECEPTACLE-LIGHT	6	
- 36	1176926	. INSULATOR- 3 POS SW	1	
- 37	1176927	. INSULATOR- 4 POS SW	1	
- 38	1176929	. LIGHT BLANK	3	A
- 38	1176928	. LIGHT BLANK	2	B
- 39	1176840	. SWITCH-COM LOCAL	1	
- 40	1176842	. LAMP	1	C
- 41	1176843	. LAMP-READY LIGHT	1	C

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
55 - 42	1187617	. SOCKET ASM-READY LIGHT	1	C
- 43	1187616	. . SOCKET-READY LIGHT	1	
- 44	360443	. . PIN,TAPER	2	
- 45	1141929	. SCREW-FRONT MTG	1	C
- 46	1187624	. SWITCH ASM-ALTN CODING MTG	1	C
- 47	1144714	. . ACTUATOR-SHIELD ALIGNING	1	
- 48	441162	. . SWITCH-MICRO	1	
- 49	1166847	. . PAPER-FISH	AR	
- 50	1187618	. . BRACKET-ALTN CODING SW MTG	1	
- 51	1187775	. BRACKET,LIGHT MTG-RH-2740-2	1	
- 52	734857	. LAMP-2740-2	7	
- 53	2122035	. SOCKET,LAMP-2740-2	7	
- 54	5173719	. CLIP,LAMPHOLDER-2740-2	7	
- 55	1187770	. BRACKET,LIGHT MTG-LH-2740-2	1	
- 56	1187769	. SEAL-LH-2740-2	1	
- 57	1187771	. SEAL-REAR RH-2740-2	1	
- 58	1187772	. SEAL-RH-2740-2	1	
- 59	438566	. SCREW-2740-2	2	

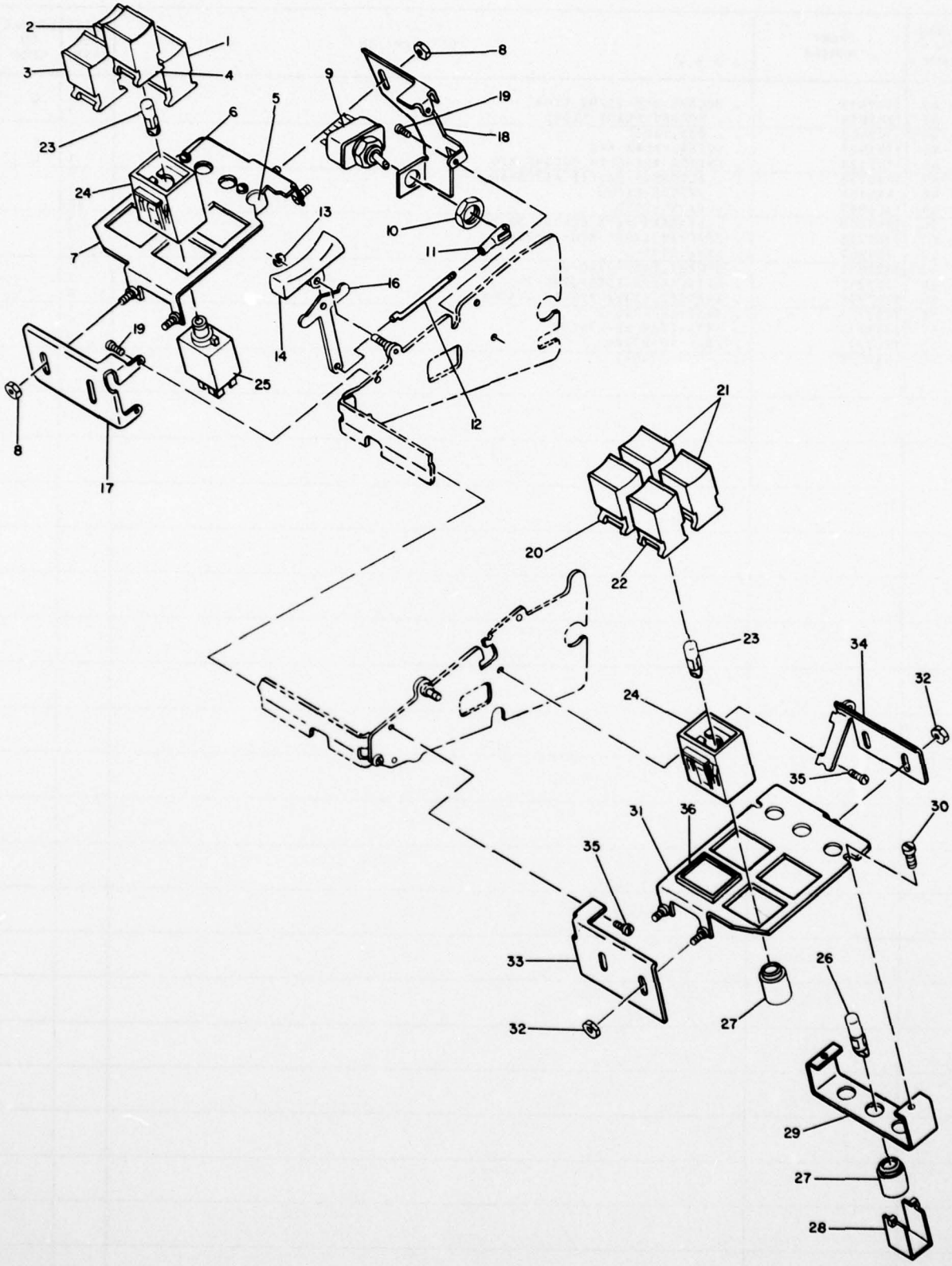


FIGURE 56. 1980 CONTROL BUTTONS AND LIGHT ASSEMBLY. SEE LIST 56.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION		UNITS PER ASM.	USABLE ON CODE
		1980 CONTROL BUTTONS AND LIGHT ASSEMBLY			
56 -	NO NO.	CONTROL BUTTONS AND LIGHTS ASM- 1980 USED ONLY ON MACHINES 1980 SEE FIGURE 56 FOR ILLUSTRATION		NP	
- 1	1187270	. BUTTON-SEND WHITE		1	
- 2	1187450	. BUTTON-DATA CHECK RED USED ON 1980-12 ONLY		1	
- 2	1187269	. BUTTON-DATA ERROR RED USED ON 1980-9 ONLY		1	
- 3	1187273	. BUTTON-CLEAR		1	
- 4	1187271	. BUTTON-ENTER GREEN		1	
- 5	1187479	. BRACKET-MODE LIGHT LH		1	
- 6	1164582	. SCREW	ATT PT	2	
- 7	1187485	. BRACKET ASSEMBLY-SWITCH MTG LH		1	
- 8	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL W	ATT PT	4	
- 9	1187330	. SWITCH-ON/OFF LINE		1	
- 10	179743	. NUT,PLAIN,HEX- 15/32-32 X 9/16 FL W	ATT PT	1	
- 11	107002C	. CLEVIS-LINK		1	
- 12	107034C	. LINK-TAB ACTUATOR		1	
- 13	1073418	. RING-RETAINING		1	
- 14	118740E	. KEYBUTTON,TYPEWRITER-ON LINE OFF LINE		1	
- 16	112352C	. BELLCRANK-KEYBUTTON		1	
- 17	118748C	. BRACKET-SWITCH MTG FRONT		1	
- 18	1187481	. BRACKET-SWITCH MTG REAR		1	
- 19	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	ATT PT	4	
- 20	1187453	. LENS,ATTENTION-YELLOW USED ON 1980-12 ONLY		1	
- 20	1187259	. LENS,MESSAGE-YELLOW USED ON 1980-9 ONLY		1	
- 21	1187261	. LENS		2	
- 22	1187260	. LENS-SPLIT PLATEN I/C/M USED ON 1980-9 ONLY		1	
- 22	1187261	. LENS USED ON 1980-12 ONLY		1	
- 23	1187393	. LAMP-INDICATOR		8	
- 24	827841	. HOUSING-SWITCH AND LIGHT		8	
- 25	483550	. SWITCH,ILLUMINATED-PUSH MOMENTARY		1	
- 26	1187393	. LAMP-INDICATOR		5	
- 27	2122035	. HOLDER-LAMP		5	
- 28	5173719	. CLIP-LAMPHOLDER		5	
- 29	118747E	. BRACKET-MODE LIGHT RH		1	
- 30	1164582	. SCREW	ATT PT	2	
- 31	1187486	. BRACKET ASSEMBLY-LENS RH		1	
- 32	257187	. NUT,PLAIN,HEX- 6-32 X 3/8 FL W	ATT PT	4	
- 33	1187482	. BRACKET-LENS MTG FRONT		1	
- 34	1187483	. BRACKET-LENS MTG REAR		1	
- 35	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	ATT PT	4	
- 36	1145381	. SPACER-FOAM RUBBER		4	

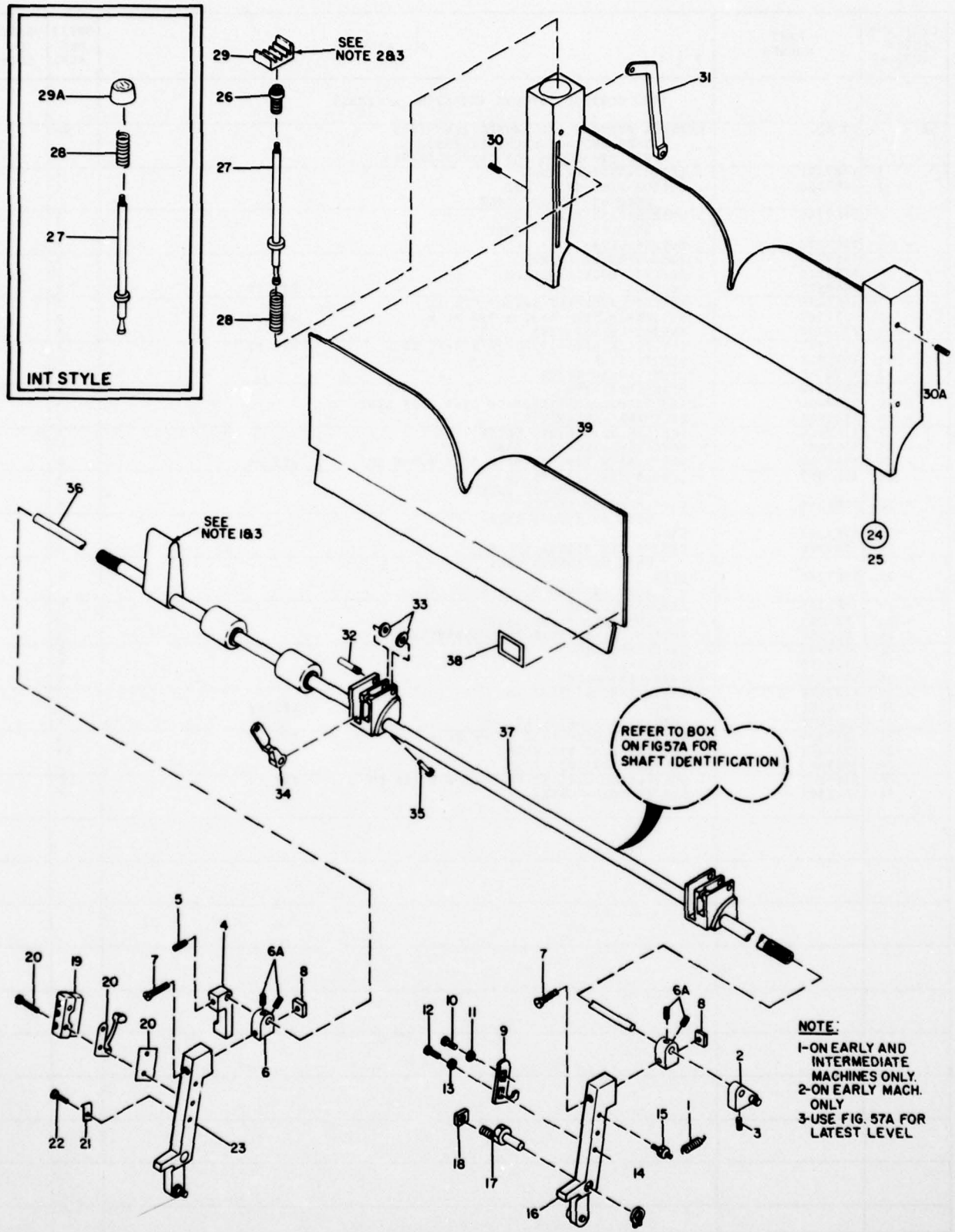


FIGURE 57. 1980-9 AND 1980-12 EARLY AND INTERMEDIATE DOCUMENT INSERTION ASSEMBLIES. SEE LIST 57.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION		UNITS PER ASM.	USABLE ON CODE
	1980-9 AND	1980-12 EARLY AND INTERMEDIATE DOCUMENT INSERTION ASSEMBLIES			
57 -		CODE A USED ON 1980-9-6.00 INCH CODE B USED ON 1980-12-7.38 INCH CODE C USED ON 1980-9-7.38 INCH AETNA			
-	NO NO.	DOCUMENT INSERTION AND PAPER BAIL ASM SEE FIGURE 57 FOR ILLUSTRATION		NP	
- 1	1187665	. SPRING-EXTENTION		1	
- 2	1187307	. ACTUATOR ASM-DETENT SPRING		1	
- 3	1175104	. SETSCREW-4-40X3/16 LG.	ATT PT	1	
- 4	1187305	. ACTUATOR-DOC. INS. SWITCH		1	
- 5	1175101	. SETSCREW-4-40X1/8 CUP PT	ATT PT	1	
- 6	5173794	. CLIP-SHAFT HOLDING		2	
- 6A	257957	. SETSCREW		6	
- 7	438574	. SCREW	ATT PT	2	
- 8	1134829	. NUT	ATT PT	2	
- 9	1128929	. STOP-PAPER BAIL ARM		1	
- 10	1091817	. SCREW-6-40X5/32 LG.	ATT PT	1	
- 11	1187833	. STOP-FR ARM RIS	ATT PT	±	
- 12	251970	. SCREW-4-40X1/4 LG.	ATT PT	1	
- 13	150209	. WASHER,STAR	ATT PT	1	
- 14	528552	. RING,RETAINING		1	
- 15	1187475	. STUD-ANCHOR SPRING		1	
- 16	1187291	. ARM ASM.-PAPER BAIL RH		1	
- 17	1166938	. STUD-ECCENTRIC PAPER BAIL LEVER		1	
- 18	1134829	. NUT		1	
- 19	355343	. SWITCH-SPDT		1	
- 20	536396C	. ACTUATOR,SWITCH-INCLUDES HDWE. AND INSUL.		1	
- 21	203660	. SWITCH,STACKER STOP		1	
- 22	116458C	. SCREW-4-40X1/4 LG.	ATT PT	1	
- 23	1187292	. ARM ASM-PAPER BAIL LH		1	
- 24	1203201	. DOCUMENT INSERTION ASM-6.00 INCH		1	A
- 24	1203202	. DOCUMENT INSERTION ASM-7.38 INCH		1	B
- 24	1187781	. DOCUMENT INSERTION ASM-7.38 INCH AETNA		1	C
		NOTE: EARLY LEVEL DOCUMENT ASM. NO LONGER AVAILABLE ORDER APPROPRIATE ASM (INDEX 24) FOR ALL ITEMS THAT HAVE			
		NO NO. SEE FIGURE 19 NOTES 1 & 2 TO DETERMINE BETWEEN EARLY AND INTERMEDIATE LEVEL MACHINES.			
- 25	1159033	. . POST-DOCUMENT INSERTION GUIDE-INT STYLE		1	A
- 25	1159113	. . POST-DOCUMENT INSERTION GUIDE-INT STYLE GUIDE POST FOR EARLY LEVEL		1	
		1980-9,12 OBSOLETE ORDER APPROPRIATE INDEX 24			
- 26	NO NO.	. . STUD-DETENT RLS GUIDE-ORDER INDEX 24		NP	
- 27	1187469	. . SHAFT-DETENT RLS-EARLY STYLE		1	
- 27	1159249	. . SHAFT-DETNET RLS-INT. STYLE		1	
- 28	1187472	. . SPRING-DETENT RETURN		1	
- 29	1187249	. . BUTTON-DETENT RLS. EARLY STYLE		1	
- 29A	1159319	. . BUTTON-DETENT RLS. INTERMEDIATE STYLE		1	
- 30	1187471	. . PIN-LINK PIVOT LH	ATT PT	2	
- 30A	1203203	. . PIN-LINK PIVOT RH	ATT PT	2	
- 31	1187467	. . LINK-DOCUMENT INSERT REAR-EARLY STYLE		2	
- 31	1159475	. . LINK-DOCUMENT INSERT REAR-INT.STYLE		2	
- 32	1203204	. . SHAFT-REAR LINK PIVOT-INT.STYLE SHAFT FOR EARLY LEVEL 1980-9, 12 OBSOLETE ORDER APPROPRIATE INDEX 24 FOR REPLACEMENT.		2	
- 33	251989	. . RING-RETAINING	ATT PT	4	
- 34	1187468	. . LINK-DOCUMENT INSERT FRONT-EARLY STYLE		2	
- 34	1159474	. . LINK-DOCUMENT INSERT FRONT-INT.STYLE		2	
- 35	1187470	. . STUD-DOCUMENT INSERT. SHAFT LOCKING	ATT PT	2	
- 36	1187301	. . SHAFT-PAPER BAIL INTERNAL-EARLY STYLE		1	A
- 36	1187473	. . SHAFT-PAPER BAIL INTERNAL-EARLY STYLE		1	B
- 36	1159473	. . SHAFT-PAPER BAIL INTERNAL-INT.STYLE		1	A
- 36	1159472	. . SHAFT-PAPER BAIL INTERNAL-INT.STYLE		1	B
- 36	1187783	. . SHAFT-PAPER BAIL INTERNAL-INT.STYLE		1	C
- 37	1203200	. . SHAFT ASM.-EXT PAPER BAIL-INT.STYLE		1	A
- 37	1159150	. . SHAFT ASM.-EXT PAPER BAIL-INT.STYLE		1	B
- 37	1187784	. . SHAFT ASM.-EXT PAPER BAIL-INT.STYLE SHAFT ASM-EXT FOR EARLY LEVEL 1980-9,12 OBSOLETE		1	C
		ORDER APPROPRIATE INDEX 24 FOR REPLACEMENT.			

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
57 - 38	1187489	. WINDOW-DECAL LOCATION	1	
- 39	1187464	. WINDOW-DOC.INSERT. EARLY STYLE	1	A
- 39	1187465	. WINDOW-DOC.INSERT. EARLY STYLE	1	B
- 39	1159189	. WINDOW-DOC.INSERT. INT. STYLE	1	A
- 39	1159179	. WINDOW-DOC.INSERT. INT. STYLE	1	B
- 39	1187886	. WINDOW-DOC.INSERT. INT. STYLE	1	C

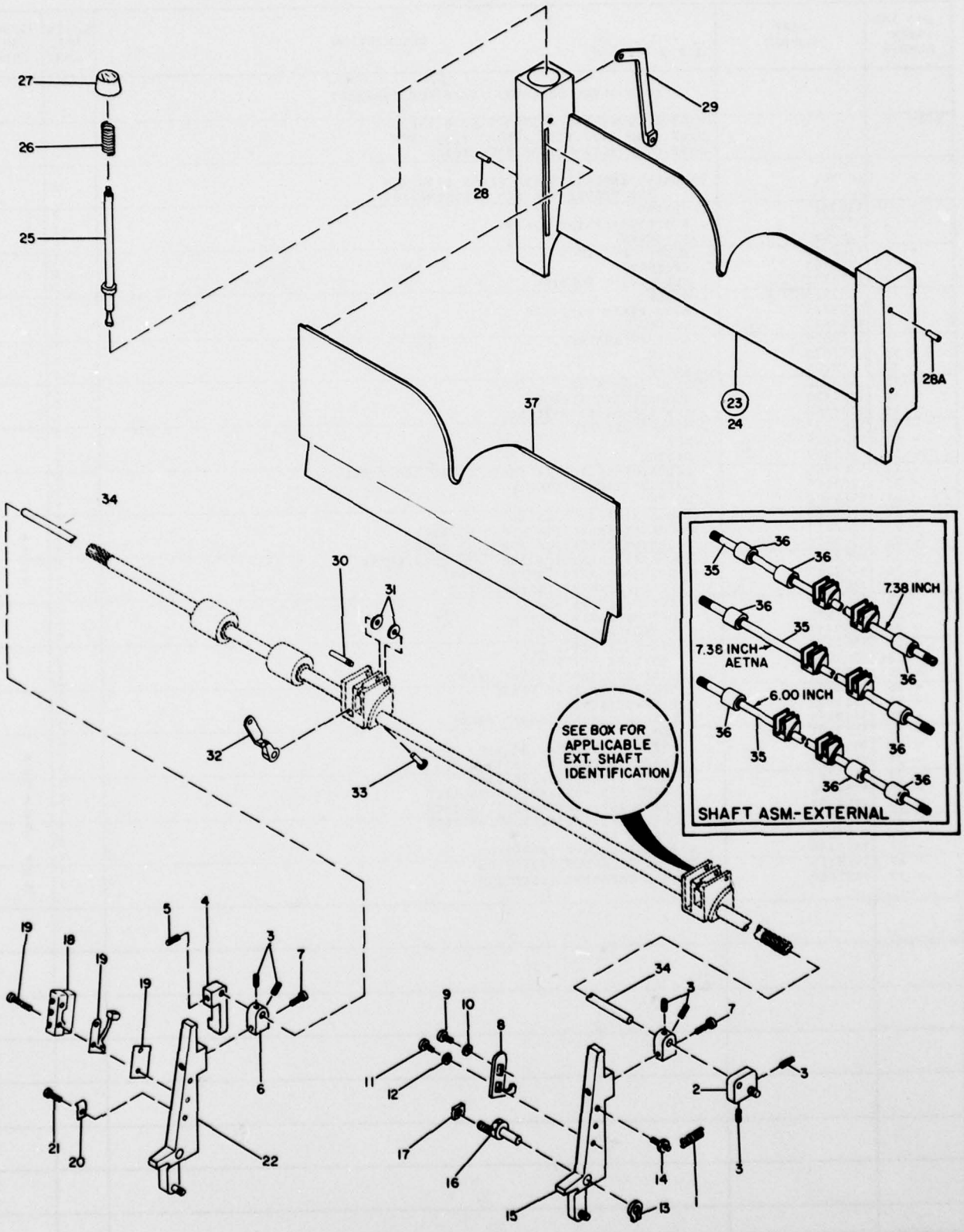


FIGURE 57A. LATE STYLE DOCUMENT INSERTION ASSEMBLY. SEE LIST 57A.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		LATE STYLE DOCUMENT INSERTION ASSEMBLY		
57A-		CODE A ON 1980-9 & 2740-2 6.00 INCH CODE B ON 1980-12 & 2740-2 7.38 INCH CODE C ON 1980-9 7.38 INCH AETNA		
-	NO NO.	DOCUMENT INSERTION AND PAPER BAIL ASM SEE FIGURE 57A FOR ILLUSTRATION	NP	
- 1	1187665	. SPRING	1	
- 2	5173793	. ACTUATOR-DETENT SPRING	1	
- 3	257957	. SETSCREW	6	
- 4	1187305	. ACTUATOR-SWITCH	1	
- 5	1175101	. SETSCREW	1	
- 6	5173794	. CLIP-SHAFT HOLDING	2	
- 7	322065	. SCREW	2	
- 8	1128929	. STOP-PAPER BAIL ARM	1	
- 9	1091817	. SCREW	1	
- 10	1187833	. STOP-FR ARM RLS.	1	
- 11	251970	. SCREW	1	
- 12	150209	. WASHER	1	
- 13	528552	. RING-RETAINING	1	
- 14	1187475	. STUD-SPRING ANCHOR	1	
- 15	1203868	. ARM ASM-PAPER BAIL RH	1	
- 16	1166938	. STUD-ECCENTRIC	1	
- 17	1134829	. NUT	1	
- 18	355343	. SWITCH	1	
- 19	5363960	. ACTUATOR-SWITCH INCLUDES HDWE. AND INSUL.	1	
- 20	203660	. SWITCH-STACKER STOP	1	
- 21	1164580	. SCREW	1	
- 22	1203869	. ARM ASM-PAPER BAIL LH	1	
- 23	1203871	. DOCUMENT INSERTION ASM-6.00 INCH	1	A
- 23	1203870	. DOCUMENT INSERTION ASM-7.38 INCH	1	B
- 23	1203872	. DOCUMENT INSERTION ASM-7.38 INCH AETNA	1	C
- 24	1159033	. . POST-DOCUMENT INSERT.GUIDE	1	A
- 24	1159113	. . POST-DOCUMENT INSERT.GUIDE	1	
- 25	1159249	. . SHAFT-DETENT RLS.	1	
- 26	1187472	. . SPRING-DETENT RETURN	1	
- 27	1159319	. . BUTTON-DETENT RLS.	1	
- 28	1187471	. . PIN-LINK PIVOT LH	2	
- 28A	1203203	. . PIN-LINK PIVOT RH	2	
- 29	1159475	. . LINK-DOCUMENT INSERT.REAR	2	
- 30	1203204	. . SHAFT-REAR LINK PIVOT	2	
- 31	251989	. . RING-RETAINING	4	
- 32	1159474	. . LINK-DOCUMENT INSERT FRONT	2	
- 33	1187470	. . STUD	2	
- 34	1159473	. . SHAFT-INTERNAL-6.00 INCH	1	A
- 34	1159472	. . SHAFT-INTERNAL-7.38 INCH	1	B
- 34	1187783	. . SHAFT-INTERNAL-7.38 INCH	1	C
- 35	1159476	. . SHAFT ASM.-EXTERNAL-6.00 INCH	1	A
- 35	1159154	. . SHAFT ASM.-EXTERNAL-7.38 INCH	1	B
- 35	1135054	. . SHAFT ASM.-EXTERNAL-7.38 INCH	1	C
- 36	1187250	. . RCLIER ASM	3	
- 37	1159189	. WINDOW-DOCUMENT INSERTION	1	A
- 37	1159179	. WINDOW-DOCUMENT INSERTION	1	B
- 37	1187886	. WINDOW-DOCUMENT INSERTION	1	C

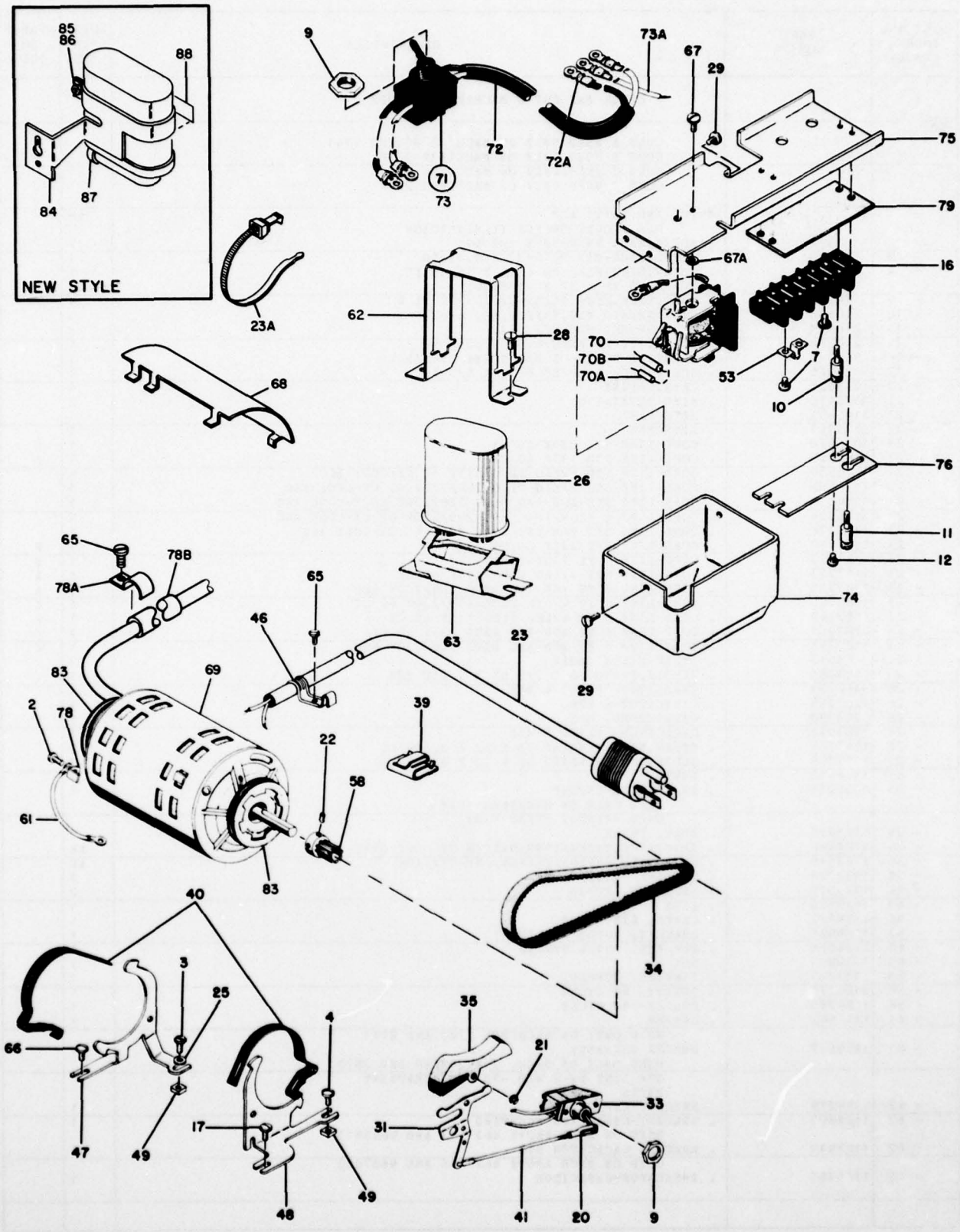


FIGURE 58. MOTOR AND DRIVE MECHANISM GROUPS. SEE LIST 58.

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		MOTOR AND DRIVE MECHANISM GROUPS		
58 -		CODE A USED ONLY ON MACH. 2740 AND 2741 CODE B USED ONLY ON MACHINES 1518		
-		CODE C USED ONLY ON MACHINES 1980 CODE D USED ONLY ON MACHINES 2970		
-	NO NO.	MOTOR AND DRIVE ASM SEE FIGURE 58 FOR ILLUSTRATION	NP	
- 2	1928	. SCREW,MACH-RH 6-32 X 1/2 LG	1	
- 3	35665	. SCREW,MACH-HEX HD 6-32 X 0.42 LG	1	
- 4	35739	. SCREW,MACH-BIND HD 6-32 X 15/16 LG	1	
- 7	55726	. SCREW-BD HD 6-32 X .188 LG	10	
- 9	179743	. NUT,PLAIN,HEX- 15/32-32 X 9/16 FL W	1	
- 10	210883	. STUD-SHIELD MTG,TAPPED,NO. 6-32	1	
- 11	210884	. STUD-SHIELD MTG,NO. 6-32	3	
- 12	210984	. SCREW, RD HD MACH-6-32 X .250 LG	1	
- 16	317310	. TERMINAL BOARD- 5 DBL SCREW TERMINALS	1	
- 17	322065	. SCREW,MACH-BIND HD 6-32 X 5/8 LG	1	
- 20	1070020	. CLEVIS-LINK	1	
- 21	1073418	. RING-RETAINING	2	
- 22	1145492	. SETSCREW	1	
- 22	1175107	. SETSCREW	1	
- 23	1076978	. CORD-LINE STD 230V 60 CY	1	B
- 23	1166298	. CORD-LINE STD 115V 60 CY	1	B
- 23	1176506	. CORD-LINE STD W/LKG PLUG 115V 60 CY-CODE A&C	1	
- 23	1176562	. CORD-LINE STD W/LKG PLUG 208/230V 60 CY-CODE A&C	1	
- 23	1176653	. CORD-LINE STD NON-LKG PLUG 208/230V 60CY-CODE A&C	1	
- 23	1176734	. CORD-LINE 6 FT W/LKG PLUG 208/230V 60 CY-CODE A&C	1	
- 23	1176778	. CORD-LINE STD NON-LKG PLUG 115V 60 CY-CODE A&C	1	
- 23	1187730	. CORD-LINE 6FT 230V 60 CY	1	B
- 23	1187732	. CORD-LINE 6 FT 115V 60 CY	1	B
- 23	1187733	. CORD-LINE 6FT W/LKG PLUG 115V 60 CY	1	A
- 23	1187735	. CORD-LINE 6 FT NON-LKG PLUG 208/230V 60C	1	A
- 23	1187745	. CORD-LINE 6 FT W/LKG PLUG 208/230V 60 CY	1	C
- 23	1187749	. CORD-LINE 6 FT W/LKG PLUG 115V 60 CY	1	C
- 23	1187751	. CORD-LINE 6 FT NON-LKG PLUG 115V 60 CY	1	C
- 23	1187753	. CORD-LINE 6 FT NON-LKG PLUG 208/230V 60C	1	C
- 23A	1159519	. STRAP-NYLON CABLE	1	
- 25	1104286	. WASHER,FL-NO. 6 X 3/8 OD X 0.050 THK	1	
- 26	1166431	. CAPACITOR- FIXED 4 MFD	1	
- 26	1203295	. CAPACITOR-6 MFD.	1	
- 26	1203288	. CAPACITOR-2 MFD.	1	
- 26	1187099	. CAPACITOR- FIXED 5 MFD	1	
- 28	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	2	
- 29	1117759	. SCREW,MACH-BINDING HD 6-32 X 0.188 LG	3	
- 31	1124410	. LEVER	1	
- 33	1135015	. SWITCH ASM-ON/OFF USED ONLY ON MACHINES 1518 USED WITHOUT TAPER PINS	1	
- 34	5173811	. BELT, DRIVE	1	
- 35	1124880	. KEYBUTTON,TYPEWRITER-SWITCH ON OFF GRAY	AR	
- 35	1187148	. KEYBUTTON,TYPEWRITER-ON/OFF-EIN/AUS	AR	
- 39	1132028	. RETAINER-WIRE TERM	1	
- 40	1132508	. RETAINER, MOTER	2	
- 41	1133520	. LINK	1	
- 46	1134822	. CLAMP, LINE CORD	1	
- 47	1134825	. BRACKET, MOTOR MTG IH	1	
- 48	1134826	. BRACKET, MOTOR MTG RH	1	
- 49	1134829	. NUT	2	
- 53	1143227	. BARRIER, JUMPER,	1	
- 58	1159175	. PULLEY- 60 CYCLE	1	
- 58	1159780	. PULLEY- 50 CYCLE	1	
- 61	1110643	. JUMPER	1	
- 61	1159637	USED ONLY ON MACHINES 2740 AND 2741 . JUMPER ASSEMBLY USED ONLY ON MACH. 1518, 1980 AND 2970	1	
- 62	1159779	SEE LIST 52-2 AND -3B FOR COMPONENT PARTS . BRACKET-CAPACITOR	1	
- 62	1124807	. BRACKET-CAPACITOR MOUNTING USED ON MACH ABOVE 4631153 AND 4683913	1	
- 62	1187414	. BRACKET-CAPACITOR MTG	1	
- 63	1159781	USED ON MACH ABOVE 4639205 AND 4687080 . INSULATOR-CAPACITOR	1	

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
58 - 63	112481C	. INSULATOR-CAPACITOR USED ON MACH ABOVE 4631153 AND 4683913	1	
- 65	1164576	. SCREW	1	
- 65	1187121	. SCREW	1	D
- 66	1164577	. SCREW,MACH-BINDING HD 6-32 X 0.312 LG	1	
- 67	438613	. SCREW,MACH-FIL H 1/4-20 X 1/2 LG	1	
- 67A	1144016	. SPACER-MTG CONT RELAY	2	
- 68	1187119	. HEAT SHIELD-MOTOR	1	
- 69	5992869	. MOTOR- 115V 60 CY 1/35 HP	1	
- 69	1203887	. MOTOR- 220/230V 50/60 CY 1/35 HP	1	
- 69	1159504	. MOTOR- 208V 60CY 1/35 HP	1	
- 69	5992871	. MOTOR-220V 50HZ 1/35 HP	1	
- 70	1176892	. RELAY-POWER	1	
- 70A	317003	. RESISTOR-47 OHM	1	
- 70B	1127453	. CAPACITOR-.25 MFD.	1	
- 71	1176895	. SWITCH ASSEMBLY-TOGGLE USED ONLY ON MACH. 2740, 2741 AND 2970	1	
- 71	1135015	. SWITCH ASM-ON/OFF	1	B
- 71	1187369	. SWITCH ASSEMBLY-TOGGLE	1	C
- 72	1176896	. . INSULATOR-TUBING USED ONLY ON MACHINES 1518	AR	
- 72	1127433	. . TUBING USED ON ALL MACHINES EXCEPT 1518	AR	
- 72A	334921	. . TERMINAL-RING,18-22 AWG,#6 HOLE,INS	4	
- 73	1187368	. . SWITCH-TOGGLE TPST	1	
- 73A	1176897	. JUMPER	1	
- 74	1176898	. SHIELD-POWER RELAY	1	
- 75	1176899	. BRACKET-PWR RELAY	1	
- 76	1176910	. SHIELD-TERMINAL	1	
- 78	1263006	. CLIP WHEN REPLACING THIS PART ON MACHINES BELOW SN 4077100 OR SN 4387000 ORDER PN 1272045	1	
- 78A	1166998	. CLAMP	1	
- 78B	1166999	. TUBING	AR	
- 79	5319912	. PLATE DESIGNATION-5 PCS	1	
- 80	1176516	. TERMINAL BRACKET ASSEMBLY NOT ILLUSTRATED	1	
- 81	1176891	USED ONLY ON MACHINES 2741 INCLUDES INDICES 7,10,11,12,16,53,71,75,76 AND 7 . POWER RELAY ASSEMBLY	1	
		NOT ILLUSTRATED USED ONLY ON MACHINES 2740 AND 2970 INCLUDES INDICES 7,10,11,12,16,29,53,67,67A, 70,74,75,76 AND 79		
- 81	1187499	. BRACKET ASSEMBLY-POWER RELAY NOT ILLUSTRATED	1	
		USED ONLY ON MACHINES 1980 INCLUDES INDICES 7,10,11,12,16,29,53,67,67A,70,7 70B,74,75,76 AND 79.		
- 82	1187224	. PLATE-PATENT AND IDENTIFICATION NOT ILLUSTRATED	1	
- 83	1174096	. BUSHING	1	
- 84	5173769	. BRACKET,CAPACITOR-HORIZ. MTG.	1	
- 84	1164384	. BRACKET,CAPACITOR MTG	1	
- 85	1141181	. SCREW	1	
- 86	257187	. NUT	1	
- 87	1173356	. INSULATOR,CAPACITOR	1	
- 88	1230142	. LABEL,WARNING	1	

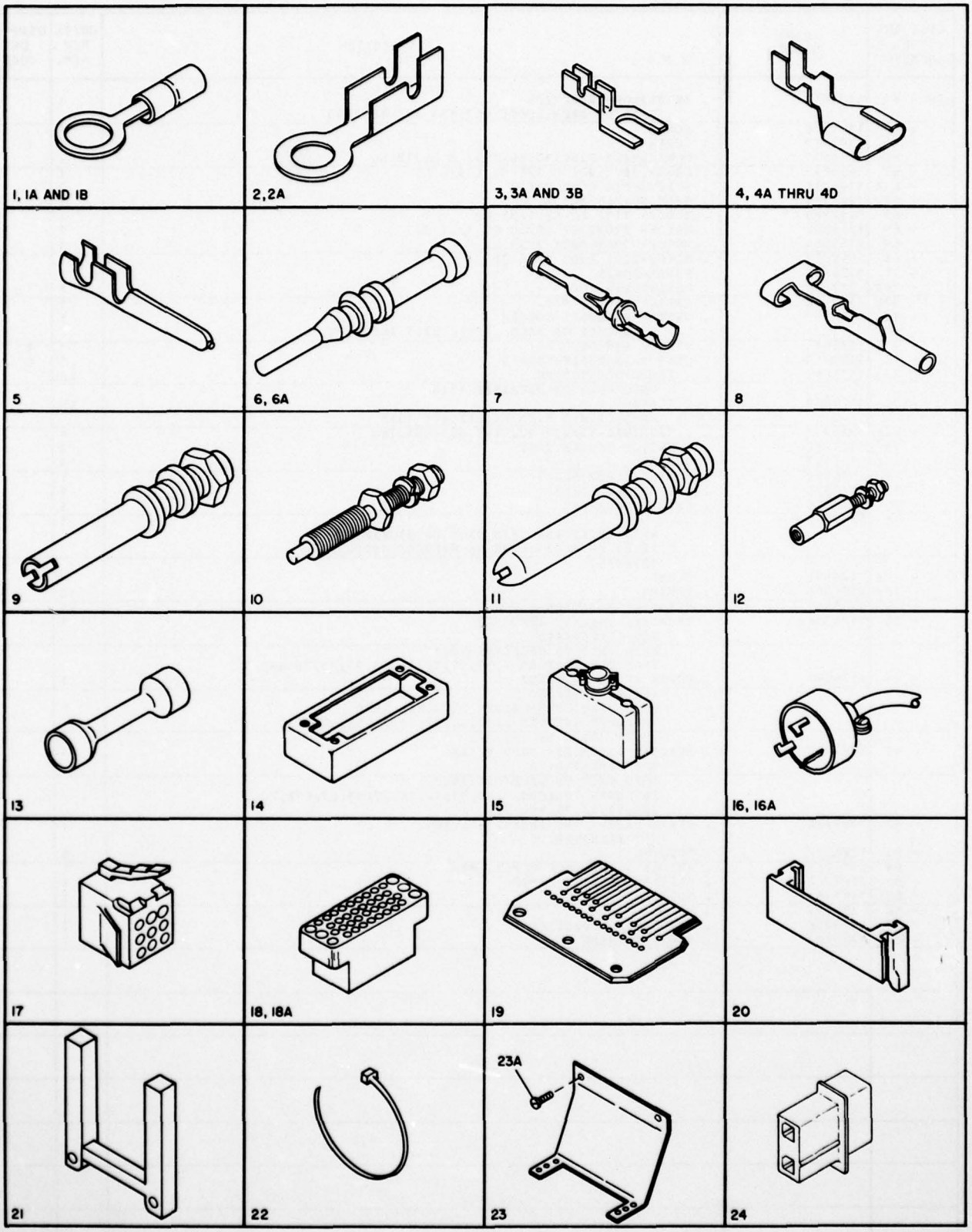


FIGURE 59. CABLE AND JUMPER ASSEMBLY COMPONENT PARTS. SHEET 1 OF 2. SEE LIST 59.

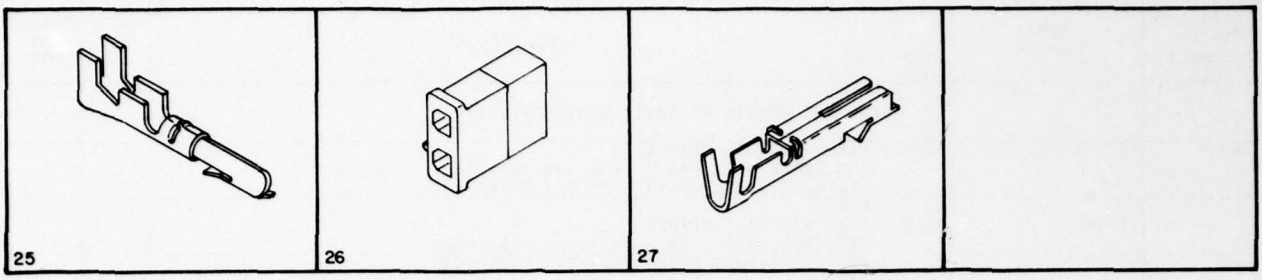
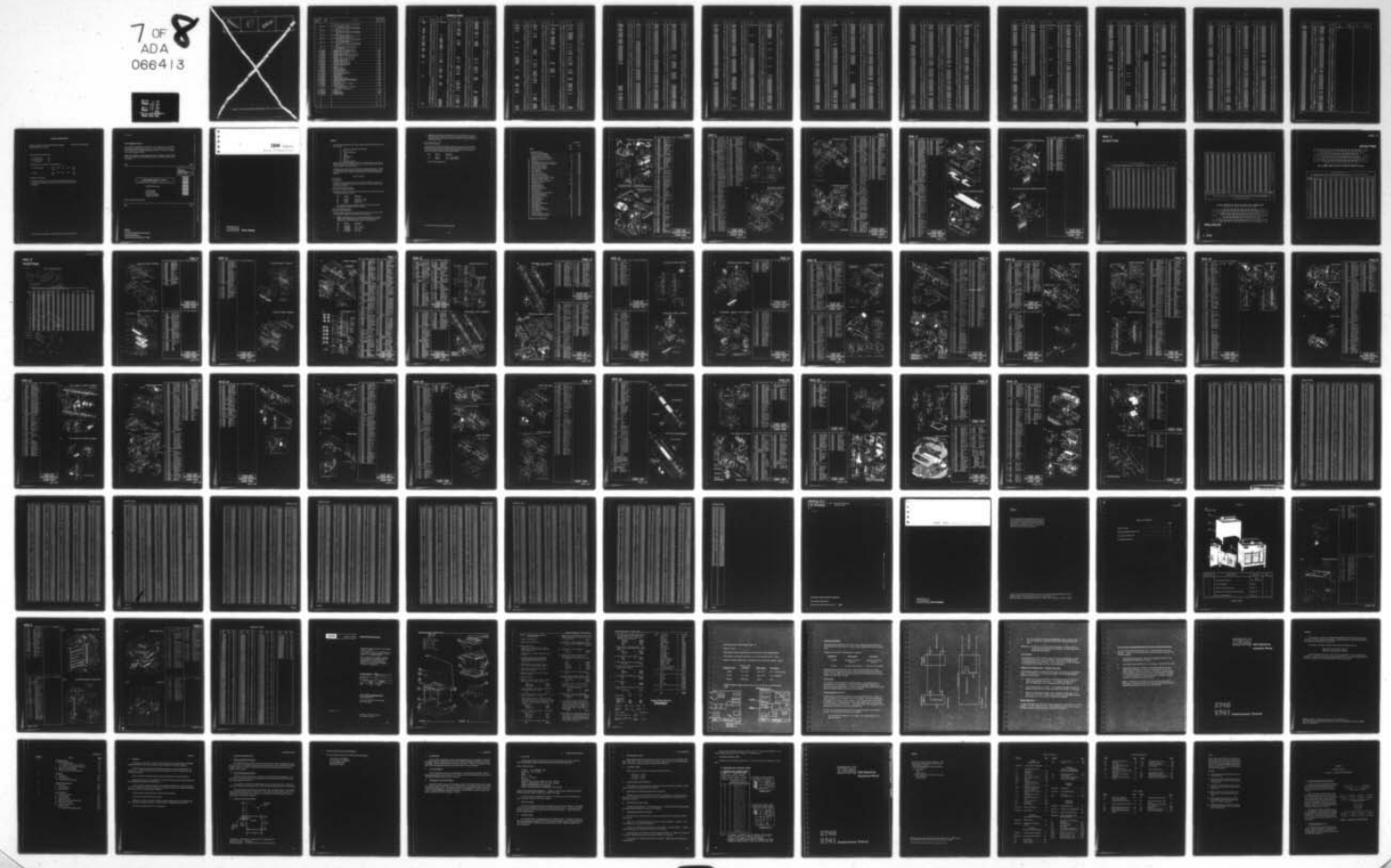


FIGURE 59. CABLE AND JUMPER ASSEMBLY COMPONENT PARTS. SHEET 2 OF 2. SEE LIST 59.

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

7 OF 8
ADA
066413



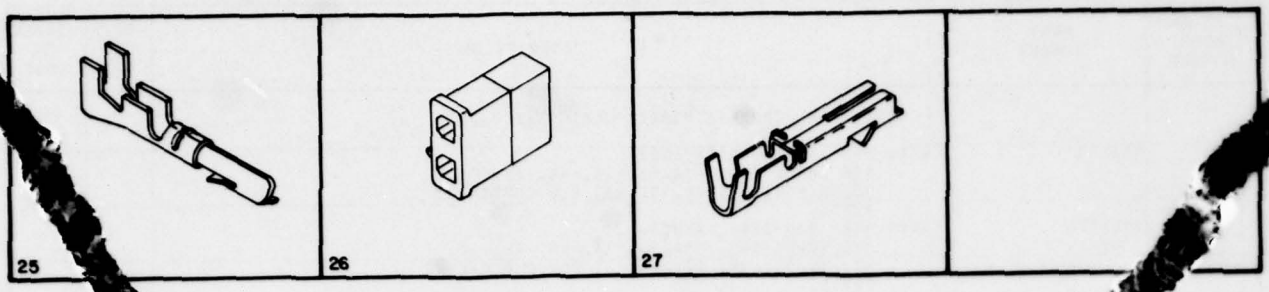


FIGURE 59. CABLE AND JUMPER ASSEMBLY COMPONENT PARTS. SHEET 2 OF 2. SEE LIST 59

LIST AND INDEX NUMBER	PART NUMBER	1 2 3 4 DESCRIPTION	UNITS PER ASM.	USABLE ON CODE
		CABLE AND JUMPER ASSEMBLY COMPONENT PARTS		
59 -	1176511	CABLE ASM- 835/2740 PRINTER SEE INDEX NOS. -1A,-3,-3A,-4A,-4B,-4C, -5,-8,-17,-19,-20,AND -21 FOR COMPONENT PARTS	1	
-	1176929	CABLE ASM- 935/2741 PRINTER SEE INDEX NOS. -1A,-3,-3A,-4A,-4B,-4C, -5,-8,-17,-19,-20,AND -21 FOR COMPONENT PARTS	1	
-	1187613	CABLE ASM- 735/1518 PRINTER SEE INDEX NOS. -2,-3,-4C,-5,-6,-6A,-7, AND -18 FOR COMPONENT PARTS	1	
-	1187248	CABLE ASM- 735/1980 PRINTER SEE INDEX NOS. -1,-1A,-3,-4,-4A,-4C,-4D, -5,-6,-6A,-9,-10,-11,-12,-14,-15, AND -18A FOR COMPONENT PARTS	1	
-	1277102	CABLE ASM- 735/2970 PRINTER SEE INDEX NOS. -1A,-3,-3A,-4A,-4E,-4C, -5,-8,-17,-19,-20,AND -21 FOR COMPONENT PARTS	1	
-	1277393	CABLE ASM- 835/2740 TAB STOP CONTROL SEE INDEX NOS. -3,-5, AND -13 FOR COMPONENT PARTS	1	
- 1	334910	. TERMINAL-RING,14-16 AWG,#6 HOLE,INS	AR	
- 1A	334921	. TERMINAL-RING,18-22 AWG,#6 HOLE,INS	AR	
- 1B	360370	. TERMINAL-WIRE RING TONGUE	AR	
- 2	257284	. TERMINAL-RING,16 AWG,#10 HOLE,NON INS	AR	
- 2A	2101657	. TERMINAL-RING NO.8 STUD	AR	
- 3	186967	. TERMINAL-SPADE,20-24 AWG,#6 HOLE,NON INS	AR	
- 3A	255994	. TERMINAL-SPADE,16 AWG,#6 HOLE,NON INS	AR	
- 3B	1117317	. TERMINAL	AR	
- 4	236915	. TERMINAL-CONTACT FEMALE 20-18 AWG	AR	
- 4A	236916	. TERMINAL-CONTACT FEMALE 24-22 AWG	AR	
- 4B	360433	. TERMINAL-PLUG,16-18 AWG	AR	
- 4C	1166039	. TERMINAL-STRAIGHT TAB RECEP	AR	
- 4D	2122016	. TERMINAL-FASTON TYPE	AR	
- 5	187243	. TERMINAL, QUICK DISCONNECT	AR	
- 6	2122258	. PIN-CONTACT,MALE 20/22 AWG	AR	
- 6A	212226C	. PIN-CONTACT,AWG 18-16	AR	
- 7	2122261	. SOCKET	AR	
- 8	1166115	. TERMINAL,SOCKET	AR	
- 9	2122636	. SOCKET,GUIDE CORNER	AR	
- 10	2123029	. JACKSCREW-STUD,FIXED	AR	
- 11	2122637	. PIN,GUIDE CORNER	AR	
- 12	2123028	. JACK SCREW,SOCKET,FIXED	AR	
- 13	321051	. CONNECTOR,TWO WAY-INSULATED	AR	
- 14	2192530	. SKIRT-CONNECTOR PIN	AR	
- 15	212785E	. HOOD,CONNECTOR	AR	
- 16	1176508	. CONNECTOR-PLUG	AR	
- 16A	1176563	. CONNECTOR-PLUG	AR	
- 17	1166498	. HOUSING-SOCKET TERMINAL	AR	
- 18	2122471	. CONNECTOR,PLUG,ELECTRICAL-MALE,50 CONT	AR	
- 18A	2127854	. CONNECTOR,PLUG,ELEC-75 MALE CONTACTS	AR	
- 19	5800610	. CARD ASM-TERMINATOR	AR	
- 20	811802	. GUIDE-CARD	AR	
- 21	5352967	. STRAIN RELIEF-.05 DIA 20 STRANDS	AR	
- 22	1159913	. CLAMP-CONT CABLE	AR	
- 23	1159682	. BRACKET-CABLE MTG USED ON ALL MACHINES EXCEPT 1518	AR	
- 23	116603E	. BRACKET-CABLE MTG USED ONLY ON MACHINES 1518	AR	
- 23A	1164576	. SCREW	AR	
- 24	1203352	. CONNECTOR-PIN	AR	
- 25	5412642	. TERMINAL-PIN	AR	
- 26	1203351	. CONNECTOR-SOCKET	AR	
- 27	5412643	. TERMINAL-SOCKET	AR	

NUMERICAL INDEX

PART NO.	LIST AND INDEX NO.
1856	17 - 1
1928	1 - 68
	39 - 21
	43 - 77
	52 - 9
	58 - 2
2994	54 - 1
3550	54 - 1A
3960	54 - 2
6351	43 - 92
6364	49 - 2
	53 - 48
	54 - 3
6503	49 - 3
7341	10 - 15
10514	44 - 7A
	50 - 1
15887	43 - 91
	52 - 33
20038	1 -174
22066	52 - 30
23106	5 - 1
25282	3 - 63
	35 - 6
	49 - 33
26320	33 - 37
27073	15 - 2
27460	11 - 1
	11 - 2
	13 - 1
	15 - 4
35534	22 - 1
35665	58 - 3
35739	1 -198
	35 - 34
	43 - 31
	51 - 23
	58 - 4
37435	10 - 1
	11 - 3
	11 - 4
	12 - 1
	13 - 2
	14 - 1
	15 - 9
	18 - 1
	19 - 1
	20 - 1
	21 - 1
	29 - 4
	30 - 4
37913	2 - 1
	3 - 18
	3 - 21
	3 - 40
	3 - 56
	3 - 61
	3 - 65
	4 - 11
	4 - 28
	8 - 1
	20 - 14
	33 - 35
	36 - 1
	38 - 1
	43 - 14
	43 - 49
	46 - 20
	46 - 28
	46 - 35
	49 - 4
	49 -118
	49 -134
	49 -136
	50 - 2
	53 - 26
	53 - 37
38051	2 - 2
	2 - 2
	3 - 8

PART NO.	LIST AND INDEX NO.
38051-CONT	4 - 59
	6 - 1
	36 -114
	38 - 2
	41 - 5
	46 - 19
	49 - 7
	49 -119
	51 - 6
	52 - 92
	53 - 17
	53 - 47
38214	5 - 3
	44 - 30
	53 - 41
38234	49 - 9
38245	2 -134
38259	50 - 3
38261	2 -128
38262	1 - 2
	39 - 33
38263	4 - 52
38266	1 - 85
38346	40 - 40
38348	54 - 79
38350	41 - 11
	49 - 11
38351	1 - 81
	49 - 12
	52 - 79
38352	38 - 4
	38 - 5
38353	2 - 62
	17 - 37
38354	11 - 5
	49 - 11
38565	36 - 6
38566	40 - 1
43373	4 - 34
	46 - 6
	46 - 44
45119	43 - 68
	44 - 7A
	46 - 53
45183	17 - 2
45611	36 - 7
45638	49 - 13
45639	1 -172
	39 - 38
	46 - 36
45677	43 - 87
46831	43 - 36
47987	2 - 63
	40 - 2
	49 - 14
	49 - 15
	50 - 4
55726	58 - 7
56313	49 - 16
56722	1 - 12
	2 - 49B
	6 - 2
	8 - 4
	9 - 25
	33 - 36
	35 - 31
	36 - 9
	40 - 3
	41 - 6
	46 - 39
	52 - 49A
	54 - 4
	54 -120
58852	3 - 50
58853	13 - 18
62031	49 - 17
71296	35 - 20
76574	54 - 22A
79193	52 - 24
100027	16 - 14

PART NO.	LIST AND INDEX NO.
100134	14 - 2
100227	29 - 3
	30 - 3
100229	12 - 2A
	20 - 2
	21 - 2
100349	15 - 14
103372	49 - 19
104278	11 - 6
	11 - 7
104285	11 - 9
104676	11 - 8
105052	10 - 2
	12 - 2
	13 - 3
	18 - 2
	19 - 2
108114	27 - 6
	39 - 14
110956	49 - 20
113512	46 - 62
118418	10 - 3
	11 - 10
	12 - 3
	13 - 4
	14 - 3
	15 - 1
	18 - 3
	19 - 3
	20 - 3
	21 - 3
	29 - 1
	30 - 1
120710	40 - 41
123491	9 - 44
	9 - 54
	53 - 33
123552	3 - 46
	24 - 1
	39 - 34
	43 - 70
125930	54 - 4A
126572	2 - 42
127269	1 -130A
129242	47 - 1
	48 - 18
129243	47 - 2
	48 - 18
150047	5 - 5
150209	27 - 17
	46 - 32
	46 - 43
	50 - 5
	57 - 13
	57A- 12
150735	4 - 70
	25 - 19
166623	3 - 67
167790	5 - 6
170215	40 - 4
	45 - 8
170225	39 - 25C
173203	29 - 2
	30 - 2
173205	10 - 4
	12 - 4
	18 - 4
	20 - 4
	21 - 4
173206	13 - 5
	19 - 4
173207	10 - 5
	11 - 11
173210	15 - 15
173215	14 - 7
177939	2 - 97
179743	55 - 1
	56 - 10
	58 - 9
183835	43 - 35

PART NO.	LIST AND INDEX NO.
186399	49 - 1
186427	53 - 32
186712	36 - 10
186923	43 - 8
186967	59 - 3
187188	5 - 83
187243	23 - 13
	24 - 19
	59 - 5
190352	28 - 1
198363	22 - 2
203660	53 - 35
	57 - 21
	57A- 20
205329	17 - 36
	24 - 1A
	47 - 3
	48 - 18
210883	58 - 10
210884	58 - 11
210984	58 - 12
216128	16 - 5
219633	1 -101
	6 - 3
	37 - 3
	37 - 4
	38 - 6
	38 - 13B
	38 - 15B
	40 - 5
	43 - 60
	45 - 28
	46 - 65
	53 - 3
219765	48 - 1
236550	21 - 13
	27 - 16
	38 - 3
236571	31 - 11
	32 - 4
	33 - 4
	36 - 11
236915	59 - 4
236916	59 - 4A
251350	2 - 65
251970	57 - 12
	57A- 11
251989	2 -125
	36 - 12
	46 - 26
	57 - 33
	57A- 31
255994	59 - 3A
257186	1 - 87
257187	2 - 66
	2 - 98
	5 - 7
	9 - 1
	25 - 28
	49 - 22
	53 - 17
	54 - 5
	56 - 8
	56 - 32
	58 - 86
257284	59 - 2
257957	32 - 15A
	43 - 63
	57 - 6A
	57A- 3
257958	39 - 26
257961	33 - 5
257962	3 - 41
257965	32 - 13
257968	32 - 2
257969	8 - 11
257971	25 - 1
257975	8 - 27
257982	13 - 6
257984	2 - 99

PART NO.	LIST AND INDEX NO.
257985	1 -182
	52 - 81
257986	43 - 87
263680	38 - 8
	49 - 23
264641	2 - 3
	2 -130
	4 - 78
	5 - 8
	11 - 12
	28 - 2
	43 - 85
	43 - 88
	44 - 2
	52 - 76
264998	2 - 67
265195	2 - 49A
	8 - 28
	43 - 67
	46 - 17
	46 - 38
302090	17 - 4
	24 - 2
	47 - 4
	48 - 19
302131	6 - 5
	17 - 5
	24 - 3
	47 - 5
	48 - 21
308459	32 - 15
311072	32 - 7
311642	54 - 6
316542	33 - 38
317003	58 - 70A
317310	58 - 16
317766	22 - 3
	23 - 2
	25 - 26
	27 - 1
	38 - 34
	40 - 45
317767	22 - 4
	23 - 3
	25 - 27
	27 - 2
	38 - 35
	40 - 46
317930	28 - 7A
321051	59 - 13
322065	2 - 69
	4 - 58
	5 - 82
	57A- 7
	58 - 17
322550	25 - 29
322551	54 - 7
324221	8 - 12
	9 - 33
	9 - 51
324497	8 - 29
	9 - 4
324595	9 - 65
326119	10 - 6
	11 - 13
	11 - 14
	12 - 5
	13 - 7
	14 - 4
	15 - 8
	18 - 5
	19 - 5
	20 - 5
	21 - 5
	29 - 9
	30 - 9
328815	52 - 62
332747	41 - 8A
	49 - 24
333182	38 - 7
334281	28 - 27
334910	59 - 1
334921	58 - 72A
	59 - 1A
338169	5 - 9
	7 - 20
	33 - 39
	43 - 42
338238	36 - 18
	53 - 40
339107	14 - 5
339109	11 - 15
	11 - 16
	12 - 6
	13 - 8
	14 - 6
	15 - 5
	18 - 6
	19 - 6
	20 - 6
	21 - 6
	29 - 5
	30 - 5
340191	2 -100
341216	38 - 64
343752	43 - 28
343755	43 - 24
355341	23 - 4
	24 - 3A
	25 - 15
	27 - 3
	28 - 3
	40 - 47
355343	33 - 40
	57 - 19
	57A- 18
357820	51 - 29
358174	49 - 26
	52 - 74
358509	1 -178
	40 - 7
	49 - 27
	50 - 6
360370	59 - 1B
360433	59 - 4B
360443	55 - 44
364710	2 - 4
438541	2 - 70
	49 - 28
438542	28 - 4
	33 - 41
438546	16 - 1
438548	48 - 20
	53 - 36
438549	6 - 6
	10 - 16
	17 - 3
	24 - 4
	25 - 25
	27 - 4
	38 - 36
	40 - 48
	43 - 48
	47 - 6
	49 -120
438550	23 - 1
	33 - 42
	38 - 65
438554	17 - 8
438558	44 - 29
438566	23 - 5
	27 - 5
	55 - 2
	55 - 59
438574	57 - 7
438613	58 - 67
438622	25 - 8
441162	55 - 48
469565	2 -111A
	5 - 10
469565-CONT	7 - 1
	50 - 17C
	50 - 18C
469656	52 - 40
472729	36 - 20
	36 - 21
478394	7 - 2
483550	56 - 25
528552	2 - 71
	57 - 14
	57A- 13
602229	39 - 28
734857	55 - 52
737858	53 - 34
801451	1 -102A
811421	54 - 9
811802	59 - 20
827841	56 - 24
1000223	1 -193
	27 - 18
	43 - 75
1014536	28 - 5
1070020	1 -133
	4 - 73
	27 - 19
	28 - 26
	36 - 22
	40 - 9
	43 - 1
	45 - 17
	52 - 8
	52 - 19
	55 - 3
	56 - 11
	58 - 20
1070340	56 - 12
1071449	1 -129
	2 -102
	3 - 68
	4 - 87
	52 - 5
1071687	40 - 10
1071691	45 - 14
1072126	24 - 5
1072703	1 -169
	2 - 5
	5 - 78
	52 - 24
1073418	1 - 75
	1 -137
	1 -147
	1 -171
	2 - 6
	2 - 72
	2 -103
	3 - 2
	4 - 7
	5 - 12
	8 - 13
	9 - 34
	35 - 28
	36 - 66
	39 - 7
	40 - 11
	40 - 44
	43 - 52
	43 - 94
	46 - 24
	46 - 51
	47 - 7
	49 - 30
	51 - 16
	52 - 28
	55 - 4
	56 - 13
	58 - 21
1073449	1 -167
	43 - 57
	46 - 49
1073863	5 - 13
1073866	1 -145
	3 - 5
1074145	16 - 16
	53 - 50
1074242	1 -194
	5 - 14
	52 - 6
1076978	58 - 23
1077389	7 - 16A
1078497	36 - 25
1078653	2 -120A
1090049	52 - 50
1090073	54 -119
1090162	5 - 16
	11 - 17
	50 - 7
	52 - 23
	53 - 10
1090175	3 - 26A
	3 - 43
	43 - 9
1090254	51 - 3
	51 - 6A
	52 - 86
1090268	36 - 26
	49 - 31
1090336	4 - 62
1090343	3 - 26
	7 - 3
	46 - 10
1090394	17 - 38
	43 - 54
1090404	36 - 27
	43 - 92
1090472	5 - 18
	43 - 72B
1090568	32 - 11
1090622	2 -105
	17 - 38
	33 - 57
	49 - 32
	54 - 10
1090630	16 - 3
	40 - 49
1090657	36 - 28
1090840	6 - 29
	46 - 1
	47 - 21
	50 - 27
	51 - 26
1090933	16 - 4
1090970	3 - 23
	17 - 38
	38 - 9
	54 - 11
1091069	43 - 61
1091073	38 - 12
1091151	42 - 7
1091618	5 - 4
	43 - 43
1091743	2 - 73
1091817	35 - 26
	57 - 10
	57A- 9
1092125	2 -106
	4 - 22
	5 - 19
	35 - 18
	43 - 45
	43 - 86
	44 - 9
	49 - 33
	49 - 33A
	49 -135
	50 - 8
	52 - 84
	53 - 12
1099884	43 - 25
1100523	1 - 14
	8 - 30

PART NO.	LIST AND INDEX NO.
1100688	2 -107
1100928	35 - 4
1100936	38 - 13D
	53 - 1
1100937	4 - 55
1100938	6 - 7
1100951	32 - 16
	46 - 48
1103695	2 - 7
1104286	58 - 25
1105663	54 -118
1106650	43 - 56
1107794	3 - 33
	52 - 20
1107795	2 - 8
1108350	19 - 7
1109028	39 - 25B
1109824	54 - 95
1110529	1 - 71
	53 - 7
1110643	58 - 61
1110668	43 - 26
1115017	4 - 69
1115057	39 - 24
1115633	2 - 9
1115734	5 - 2
1115735	40 - 12
1115736	2 - 10
1116312	49 -137
1116343	1 -191
1116877	2 -107
1116930	54 - 12
1117317	59 - 3B
1117376	1 - 37
1117391	54 - 13
	54 - 15
1117641	54 - 16
1117759	1 -199
	13 - 19
	22 - 5
	22 - 14
	24 - 6
	24 - 6A
	28 - 6
	38 - 52
	40 - 13
	40 - 50
	45 - 37
	46 - 9
	47 - 8
	47 - 22
	54 - 18
	54 -106
	55 - 5
	56 - 19
	56 - 35
	58 - 28
	58 - 29
1117865	54 - 14
1118361	52 - 14
1119359	55 - 6
1119876	28 - 7
1123520	1 - 74
	55 - 7
	56 - 16
1123526	1 - 67
1123549	31 - 12
	32 - 5
1123556	45 - 32
1123566	8 - 14
1123570	8 - 15
1123571	8 - 32
	9 - 6
1123572	8 - 33
	9 - 7
1123573	8 - 34
	9 - 8
1123574	8 - 35
	9 - 9
1123575	8 - 36

PART NO.	LIST AND INDEX NO.
1123576	8 - 37
1123577	8 - 38
	9 - 11
1123580	8 - 40
	9 - 12
1123581	8 - 41
	9 - 13
1123582	8 - 43
	9 - 14
1123588	8 - 25
	36 - 29
1123591	5 - 22
	53 - 11
1123593	5 - 23
	9 - 53
	13 - 15B
1123594	8 - 17
1123610	39 - 4
1123611	39 - 3
1123615	39 - 5
1123622	43 - 66
1123623	43 - 59
1123629	4 - 76
1123631	4 - 75
1123640	39 - 36
1123685	51 - 13
1123687	46 - 40
1123692	49 - 34
1123702	49 - 37
1123704	49 - 38
1123715	49 - 42
1123718	49 - 43
1123722	49 - 45
1123724	49 - 46
1123725	49 - 47
1123736	49 - 48
1123741	49 - 49
1123749	49 - 50
1123750	49 - 51
1123751	49 - 52
1123754	43 - 11
	43 - 74
1123779	49 - 53
1123785	36 - 30
1123807	52 - 45
1123810	52 - 65
1123812	39 - 1
1123819	5 - 24
1123822	36 - 31
1123823	36 - 31
1123824	36 - 31
1123825	36 - 31
1123827	36 - 32
	43 - 92A
	46 - 23
1123828	36 - 33
1123829	42 - 9
1123830	42 - 10
1123831	53 - 9
1123889	36 - 70
1123947	44 - 7
1123948	44 - 5
1123949	44 - 4
1123950	44 - 6
1123961	45 - 33
1123963	44 - 8
1123968	44 - 22
1123977	3 - 19
1123984	2 -108
1123987	3 - 7
1123996	2 -109
1123997	3 - 3
1124010	52 - 78
1124082	1 - 99
1124084	54 - 19
1124094	3 - 53
1124157	49 - 54
1124168	41 - 9
1124176	36 - 36
1124188	36 - 39

PART NO.	LIST AND INDEX NO.
1124190	36 - 40
1124196	36 - 41
1124206	43 - 18
1124220	36 - 47
1124234	6 - 24A
	36 - 49
1124240	39 - 25A
1124259	52 - 39
1124261	52 - 44
1124266	52 - 42
1124281	1 - 86
1124285	52 - 11
1124290	8 - 45
1124369	2 - 12
1124370	2 - 13
1124377	2 - 74
1124378	2 - 75
1124379	2 - 14
1124383	2 - 15
1124396	2 - 15A
1124397	2 - 75A
1124410	58 - 31
1124411	22 - 15
1124414	43 - 80
1124430	44 - 27
1124433	44 - 25
1124435	43 - 76
1124450	3 - 66
1124461	5 - 25
	17 - 38
1124463	4 - 8
1124506	1 - 17
	53 - 51
1124508	5 - 26
1124567	4 - 3
1124579	2 - 76
1124601	42 - 6
1124602	42 - 6
1124610	4 - 27
1124612	3 - 60
1124614	3 - 57
1124615	3 - 55
1124616	3 - 59
1124622	49 - 55
1124624	1 - 4
1124628	1 - 3
	4 - 5
1124629	1 - 1A
1124634	1 - 5
1124636	49 - 56
1124638	4 - 4
1124647	36 - 53
1124659	38 - 14
1124662	38 - 13A
1124663	36 - 54
1124664	36 - 55
	38 - 15C
1124665	36 - 56
1124668	36 - 57
1124672	36 - 58
	38 - 11
1124674	36 - 59
1124678	36 - 60
1124680	36 - 61
1124682	44 - 35
1124683	49 - 57
1124697	52 - 29
1124702	39 - 32
1124707	36 - 62
1124708	36 - 63
1124745	36 - 65
1124773	52 - 31
1124775	4 - 18
	52 - 49
1124777	2 - 16
1124801	2 - 17
1124802	2 - 18
1124803	2 - 19
1124807	58 - 62
1124810	58 - 63

PART NO.	LIST AND INDEX NO.
1124821	49 - 58
1124827	36 - 80A
1124831	36 - 69
1124836	36 - 72
	52 - 60
1124844	3 - 66
1124845	39 - 10
1124850	2 -121
1124854	2 -121
1124870	4 - 88
1124874	4 - 88
1124875	1 - 73
1124880	58 - 35
1124885	3 - 1
1124890	1 -127
1125066	39 - 7
1125828	28 - 8
1127202	54 - 90
1127433	58 - 72
1127453	58 - 70B
1127714	5 - 28
1127727	53 - 6
1127728	53 - 8
1127730	51 - 19
1127733	1 - 22
	5 - 85
	46 - 42
	53 - 30
	53 - 32
1127737	4 - 71
1127741	2 - 99
	49 - 59
1127745	1 - 42
	1 - 90
	16 - 11
1127753	51 - 20
1127754	51 - 20
1127755	51 - 20
1127756	51 - 20
1127757	51 - 20
1127760	36 - 78
1127763	2 -110
	16 - 5
	16 - 15
	49 - 5
1127764	1 - 80
1127770	36 - 79
1127771	36 - 79
1127772	36 - 79
1127773	36 - 79
1127774	36 - 79
1127785	22 - 6
	23 - 6
	24 - 7
	25 - 14
	28 - 9
	40 - 51
1127924	39 - 10
1127930	52 - 3
1127936	52 - 2
1127943	52 - 1
1127947	11 - 29
1127948	11 - 28
1128013	2 - 20
1128017	2 - 21
1128018	2 - 52
1128024	3 - 58
1128025	3 - 58
1128032	53 - 4
1128037	53 - 4
1128055	49 - 62
	49 -139
1128062	51 - 24
1128066	39 - 29
1128071	51 - 20
1128081	2 -112
1128083	2 -113
1128086	49 - 61
1128091	49 - 63
1128105	3 - 42

PART NO.	LIST AND INDEX NO.
1128108	1 - 13
1128113	4 - 72
	53 - 16
1128136	2 - 22
1128138	2 - 77
1128141	2 - 78
1128144	40 - 15
	45 - 11
1128150	2 - 23
1128151	2 - 24
1128152	2 - 79
1128161	8 - 31
1128169	4 - 31
1128173	43 - 65
1128189	52 - 69
1128190	52 - 71
1128192	52 - 75
1128199	52 - 68
1128201	1 - 38
1128204	53 - 15
1128216	53 - 31
1128221	2 - 25
1128226	53 - 25
1128231	54 -104
1128234	2 - 26
1128235	2 - 27
1128236	2 - 28
1128237	2 - 29
1128238	2 - 30
1128239	2 - 31
1128259	51 - 21
1128265	54 -103
1128270	3 - 24
1128271	3 - 34
1128274	2 - 32
1128278	2 - 80
1128280	2 - 33
1128281	36 - 31
1128282	54 - 65
	54 - 85
1128301	1 - 35
1128302	2 -114
1128303	52 - 85
1128305	39 - 19
1128307	39 - 19
1128316	39 - 13
1128318	39 - 20
1128322	39 - 25
1128323	39 - 12
1128325	4 - 33
1128326	2 - 49A
	8 - 5
	8 - 47
	9 - 26
1128327	46 - 22
1128338	4 - 35
1128356	51 - 25
	52 - 82
1128368	1 - 20
1128374	3 - 42
1128382	44 - 26
1128385	1 - 9
1128386	1 - 8
1128387	1 - 7
1128397	4 - 77
1128403	37 - 34
1128404	37 - 35
1128413	8 - 18
1128458	36 - 38
1128459	36 - 85
1128471	52 - 34
1128477	2 - 61
1128483	2 - 44
1128493	36 - 86
1128495	36 - 87
1128521	32 - 19
1128522	32 - 17
1128523	32 - 6
	33 - 6
1128524	33 - 7
1128525	32 - 10
1128526	32 - 9
1128527	32 - 8
	33 - 8
1128528	32 - 12
1128529	32 - 25
1128530	32 - 24
1128531	32 - 18
1128532	42 - 6
1128533	32 - 14
1128555	49 - 65
1128556	49 - 66
1128557	49 - 67
1128558	49 - 68
1128562	49 - 69
1128563	49 - 70
1128573	45 - 18
1128580	25 - 2
	49 - 71
1128595	2 - 52
1128605	50 - 9
1128606	50 - 10
1128607	50 - 11
1128608	50 - 12
1128609	50 - 13
1128610	50 - 14
1128611	50 - 15
1128613	50 - 16
1128616	50 - 17
1128618	5 - 42C
	50 - 17B
	50 - 18B
1128622	50 - 18
1128623	50 - 19
1128624	50 - 20
1128625	50 - 21
1128626	50 - 22
1128627	50 - 23
1128632	46 - 52
1128644	43 - 29
1128646	43 - 19
1128647	43 - 21
1128648	43 - 17
1128649	43 - 20
1128673	5 - 79
1128674	1 -143
	5 - 80
	5 - 80A
	5 - 81
1128685	46 - 12
1128686	6 - 10
1128698	46 - 31
1128714	6 - 11
1128719	38 - 14
1128721	38 - 15
1128722	38 - 16
1128723	38 - 15A
1128727	38 - 17
1128733	38 - 20
1128736	38 - 22
1128738	38 - 23
1128743	11 - 18
	11 - 19
	12 - 10
	13 - 10
	15 - 12
	19 - 8
	20 - 7
	21 - 7
1128744	11 - 20
	11 - 21
	12 - 11
	15 - 11
	19 - 9
	20 - 8
	21 - 8
1128745	10 - 8
	11 - 23
	11 - 24
	12 - 12
1128745-CONT	13 - 11
	14 - 8
	15 - 7
	18 - 7
	19 - 10
	20 - 9
	21 - 9
	29 - 7
	30 - 7
	36 - 8
1128746	10 - 9
	11 - 25
	11 - 26
	12 - 13
	15 - 13
	19 - 11
	20 - 10
	21 - 10
1128787	1 - 84
1128795	17 - 9
	17 - 9A
1128798	17 - 10
	17 - 10A
1128803	17 - 11
	17 - 11A
1128806	17 - 12
	17 - 12A
1128809	17 - 13
	17 - 13A
1128812	17 - 14
	17 - 14A
1128815	17 - 15
1128816	17 - 16
1128817	17 - 17
1128818	17 - 18
1128819	17 - 19
1128820	17 - 20
1128821	17 - 21
1128822	17 - 22
1128823	17 - 23
1128824	17 - 24
1128825	17 - 25
1128826	17 - 26
1128827	17 - 27
1128829	17 - 28
1128830	10 - REF
1128831	10 - 10
1128832	10 - 11
	14 - 9
1128833	10 - 12
1128834	10 - 13
1128837	51 - 12
1128839	51 - 11
1128859	1 -128
1128862	1 -141
1128864	43 - 50
1128866	45 - 34
1128871	52 - 15
1128874	43 - 93
1128877	43 - 3
1128879	43 - 5
1128880	43 - 95
1128881	43 - 33
1128882	21 - 14
1128883	3 - 9
1128884	43 - 46
1128885	43 - 4
1128890	43 - 2
1128891	1 -146
1128892	43 - 90
1128893	52 - 21
1128895	40 - 14
	44 - 23
1128896	21 - REF
1128897	21 - 11
1128908	38 - 66
1128909	38 - 67
1128910	28 - 10
	38 - 54
1128919	38 - 55
1128924	38 - 68
1128928	43 - 47
1128929	57 - 9
	57A- 8
1128935	52 - 7
1128939	11 - REF
1128946	11 - 27
1128950	11 - 30
1128952	11 - 31
1128954	11 - 32
1128958	24 - 8
1128959	24 - 9
1128962	23 - 7
	24 - 10
	25 - 24
	27 - 7
	40 - 49A
1128964	6 - 12A
	22 - 13A
	23 - 8
	24 - 11
	25 - 23
	40 - 52
1128965	22 - 7
	23 - 9
	24 - 12
	25 - 18
	27 - 9
	28 - 11
	38 - 56
	40 - 53
1128966	22 - 8
	23 - 10
	24 - 13
	25 - 16
	27 - 10
	28 - 12
	38 - 57
	40 - 54
1128967	22 - 9
	23 - 11
	24 - 14
	25 - 22
	27 - 11
	28 - 13
	38 - 58
	40 - 55
1128968	22 - 10
	24 - 15
1128969	24 - 16
	40 - 56
1128971	52 - 32
1128975	2 -119
1128993	38 - 46
1128994	38 - 69
1132003	4 - 36
1132009	43 - 81
1132012	43 - 62A
1132013	43 - 64
1132027	43 - 58
1132028	58 - 39
1132051	49 - 72
1132052	49 - 73
1132055	2 - 81
1132064	3 - 51
	8 - 19
1132068	38 - 59
1132069	8 - 48
1132080	1 - 28
1132084	5 - 34
1132098	5 - 35
1132103	1 - 36
1132117	5 - 36
1132122	1 - 98
	5 - 37
	35 - 17
1132147	53 - 52
1132150	45 - 36
1132165	3 - 44
1132166	44 - 1

PART NO.	LIST AND INDEX NO.
1132185	53 - 46
1132186	44 - 32
1132211	46 - 29
1132212	1 -104
	41 - 15
1132218	2 - 34
1132219	2 - 35
1132222	2 - 36
1132235	52 - 13
1132248	54 - 66
1132252	52 - 3
1132256	52 - 3
1132259	52 - 2
1132263	52 - 2
1132266	52 - 1
1132270	52 - 1
1132508	58 - 40
1132713	53 - 5
1132887	17 - 7
1133503	49 - 75
1133520	43 - 79
	55 - 8
	58 - 41
1133548	8 - 49
1133565	49 - 77
1133568	49 - 79
1133569	49 - 80
1133575	49 - 81
1133579	45 - 31
1133583	8 - 50
1133584	5 - 38
1133586	45 - 16
1133589	2 - 82
1133590	2 - 83
1133593	2 - 37
	33 - 43
1133597	43 - 69
1133598	43 - 71
1133618	49 - 85
1133619	35 - 16
	49 - 86
1133622	3 - 4
1133627	43 - 55
1133628	43 - 51
1133633	44 - 15
1133641	49 - 87
1133647	44 - 19
1133654	44 - 20
1133658	36 - 97
1133659	36 - 98
	46 - 54
1133662	49 - 88
1133663	2 -116
1133667	2 - 38
1133668	2 - 39
	49 - 89
1133669	49 -139
1133672	52 - 16
1133679	44 - 16
1133681	8 - 89
1133682	44 - 17
1133683	44 - 18
1133686	3 - 69
1133746	52 - 52
1133808	1 - 73
1133809	1 -127
1133810	52 - 1
1133811	3 - 66
1134712	5 - 39
1134767	46 - 33
1134768	45 - 27
1134773	2 - 40
1134784	45 - 29
1134801	54 - 67
	54 - 86
	54 - 91
1134803	36 -101
1134817	49 - 91
1134822	58 - 46
1134825	58 - 47

PART NO.	LIST AND INDEX NO.
1134826	58 - 48
1134829	1 - 6
	1 - 69
	2 - 41
	11 - 33
	39 - 22
	43 - 78
	52 - 10
	57 - 8
	57 - 18
	57A- 17
	58 - 49
1134831	45 - 26
	47 - 9
	48 - 10
1134837	2 - 42
	2 - 52A
	49 - 92
1134841	41 - 4
1134842	36 - 75
	36 -102
	49 -132
1134843	41 - 7
1134868	2 - 84
1134878	49 - 95
1134887	46 - 2
1134888	39 - 31
1134899	3 - 72
1134948	5 - 40
1134952	1 - 76
1134964	49 - 35
1134966	49 - 78
1134972	44 - 7A
1134977	3 - 35
1134981	44 - 31
1134987	44 - 36
1135015	58 - 33
	58 - 71
1135028	49 - 97
1135029	49 - 98
1135031	49 - 99
1135052	50 - 24
1135054	57A- 35
1135055	48 - 5
1135058	51 - 10
1135065	32 - 1
1135078	54 - 47
1135079	49 -121
1135083	39 - 2
1135084	39 - 30
1135089	43 - 27
1135096	45 - 30
1135097	45 - 35
1135118	54 - 56
1135125	46 - 18
1135129	46 - 14
1135130	43 - 13
	46 - 15
1135134	6 - 12
	24 - 17
	47 - 10
	48 - 6
1135163	53 - 38
1135164	53 - 39
1135167	2 -118
1135168	45 - 15
1135175	16 - 6
1135177	16 - 7
1135178	16 - 8
1135179	3 - 35
	16 - 9
1135180	16 - 10
1135192	32 - 8
1135193	5 - 84
	6 - 9
1135219	51 - 5
1135229	5 - 81A
1135233	8 - 53
1135234	43 - 22
1135235	43 - 30

PART NO.	LIST AND INDEX NO.
1135236	51 - 7
1135248	54 - 20
1135258	16 - REF
1135289	15 - 3
1135302	24 - REF
1135306	12 - REF
1135307	12 - 9
1135308	12 - REF
1135309	12 - 9
1135311	8 - 6
	9 - 27
1135312	1 -196
1135314	53 - 29
1135320	52 - 77
1135323	32 - 24
1135324	32 - 3
1135327	32 - 3
1135330	32 - 3
1135333	32 - 3
1135337	32 - 10
1135338	32 - 18
1135340	1 -192
1135346	53 - 44
1135347	53 - 43
1135357	48 - 7
1135363	54 - 21
1135377	31 - 1
	32 - 1
	33 - 1
1135378	50 - 15
1135379	50 - 9
1135381	2 - 43
1135408	5 - REF
1135413	48 - 3
1135425	11 - 34
1135433	54 - 45A
1135456	2 - 44
1135466	10 - 14
	11 - 35
	11 - 36
	12 - 8
	15 - 10
	19 - 13
	20 - 11
	21 - 12
1135467	10 - 7
	11 - 37
	11 - 38
	13 - 12
	14 - 10
	15 - 6
	18 - 8
	19 - 14
	20 - 12
	29 - 6
	30 - 6
1135483	48 - 2
1135485	17 - 28
1135491	54 - 22
1135493	46 - 4
1135495	44 - 38
1135496	43 - 12
1135498	43 - 15
1135506	43 - 38
1135507	43 - 39
1135508	43 - 40
1135511	43 - 34
1135512	10 - 18
1135570	32 - 1
1135573	17 - 30
	23 - 12
	24 - 18
	25 - 31
	40 - 59
1135575	47 - 23
1135583	51 - 28
1135590	41 - 13
1135591	41 - 14
1135592	53 - 45
1135593	53 - 49

PART NO.	LIST AND INDEX NO.
1135603	43 - 47A
1135604	52 - 18
1135605	45 - 20
1135621	14 - 11
1135629	13 - 13
1135643	38 - 31
1135738	48 - 16
1135739	54 - 23
1135740	54 - 23
1135746	48 - 9
1135749	54 - 44
1135754	32 - 3
1135755	32 - 3
1135756	32 - 3
1135757	32 - 3
1135758	32 - 3
1135759	32 - 3
1135760	32 - 3
1135761	32 - 3
1135762	32 - 3
1135763	32 - 3
1135764	32 - 3
1135765	32 - 3
1135766	32 - 3
1135767	32 - 3
1135768	32 - 3
1135780	42 - 6
1135826	49 -100
1135868	28 - 14
	33 - 44
1135995	51 - 30
1135999	54 - 44
1136076	42 - 1
1138108	5 - 30
1138116	8 - 54
1138118	2 - 45
1138122	2 -119
1138353	7 - 6
	36 -103
1138358	31 - 10
1138360	31 - 4
1138363	31 - 9
1138384	43 - 37
1138390	46 - 27
1138391	46 - 25
1138392	51 - 32
1138393	51 - 31
1138452	53 - 13
1138454	3 - 27
	5 - 43
1138455	52 - 12
1138462	49 -101
1138464	43 - 44
	43 - 80A
	43 - 86
1138795	53 - 19
1138796	38 - 21
	42 - 8
1138799	3 - 54
1138800	3 - 54
1138802	1 - 27A
1138805	5 - 44
1138810	45 - 12
1138950	1 - 73
1138974	3 - 73
1138975	44 - 26
	44 - 37
1138990	31 - 12A
1141030	52 - 36
1141051	54 - 25
1141071	3 - 41
1141072	3 - 64
1141073	53 - 20
1141075	49 -102
1141084	49 - 96
1141103	3 - 25
1141105	3 - 22
1141106	3 - 20
1141117	43 - 53
1141129	46 - 37

PART NO.	LIST AND INDEX NO.
1141136	54 - 26
1141141	53 - 24
1141144	36 - 31
1141146	1 - 72
1141147	52 - 78
1141151	36 -107
1141172	4 - 38
1141173	4 - 39
1141175	39 - 8
1141176	36 - 79
1141181	58 - 85
1141182	36 -111
1141189	36 - 80
1141200	36 -113
1141215	52 - 35
1141223	1 -100
	1 -153
	39 - 23
	53 - 3
1141226	53 - 42
1141227	39 - 17
1141228	4 - 83
1141231	4 - 84
1141232	39 - 15
1141235	36 -115
1141238	36 -116
1141245	4 - 40
1141266	44 - 10
1141267	44 - 10
1141269	1 -144
	52 - 17
1141270	1 - 89
1141277	2 - 46
1141282	2 - 47
1141284	2 - 48
1141285	2 - 49
1141290	4 - 42
1141298	2 - 51
1141371	1 - 27D
1141374	45 - 23
1141375	45 - 24
1141376	45 - 22
1141377	45 - 25
1141378	45 - 21
1141379	45 - 19
1141381	44 - 13
1141382	45 - 38
1141383	45 - 13
1141474	39 - 6
1141508	36 - 52
1141520	54 - 28
1141532	1 - 26
1141586	2 - 85
1141595	2 - 52
1141619	36 -119
1141622	36 -120
1141624	36 -121
1141625	36 - 84
1141626	36 -122
1141627	36 -123
1141629	36 -124
1141630	36 -125
1141636	36 -148
1141637	36 -126
1141647	40 - 19
1141649	40 - 16
	54 - 29
1141650	9 - 16
	40 - 20
1141651	40 - 21
	45 - 7
1141652	40 - 22
1141655	40 - 23
1141663	40 - 24
	45 - 10
1141666	40 - 25
1141678	1 - 24
1141749	41 - 10
1141752	36 -112
1141757	36 -127

PART NO.	LIST AND INDEX NO.
1141759	36 -128
1141761	40 - 26
1141765	40 - 27
1141770	36 -108
1141771	36 -149
	40 - 28
1141772	36 -109
1141776	2 - 56
1141780	40 - 29
1141800	37 - 24
1141801	37 - 25
1141805	40 - 31
1141809	42 - 6
1141810	42 - 6
1141834	43 - 79
1141835	40 - 32
1141837	54 - 30
1141838	3 - 16
1141846	1 - 23
1141860	44 - 34
1141861	44 - 33
1141864	2 - 79
1141865	2 - 89A
1141866	2 - 90A
1141867	2 -135
1141868	2 -136
1141872	2 - 75A
1141878	37 - 26
1141889	37 - 27
1141890	40 - 34
1141895	40 - 35
	45 - 5
1141896	45 - 9
	49 -130
1141897	54 - 24
1141924	54 -105
1141925	54 -105
1141928	42 - 11
1141929	44 - 24
	44 - 39
	55 - 45
1141936	1 - 11
1141976	32 - 3
1141977	32 - 3
1141979	1 - 10
1141992	52 - 83
1141997	36 - 95
1142214	13 - 15A
1142264	40 - 8
1142377	18 - 11
	19 - 15
1142683	31 - 11A
1142790	48 - 13
1143227	58 - 53
1143993	9 - 55
1144016	58 - 67A
1144150	1 - 70
1144376	46 - 8
1144666	49 -104
1144714	55 - 47
1144808	52 - 87
1144916	55 - 9
1144928	1 -168
	3 - 39
1144933	43 - 3
1144979	52 - 37
1145202	2 - 52A
	25 - 3
	35 - 1
1145359	53 - 51
1145381	56 - 36
1145414	6 - 8
1145415	47 - 23
1145446	39 - 18
1145478	3 - 37
1145479	4 - 9
1145492	58 - 22
1145508	43 - 32
1145516	1 - 29
1145543	9 - 26

PART NO.	LIST AND INDEX NO.
1145543-CONT	35 - 30
	41 - 19
1145588	12 - 7
1145621	23 - REF
1145622	23 - 15
1145623	23 - 16
1147182	49 - 84
1147260	36 -129
1147319	3 - 58
1147320	3 - 58
1147335	3 - 57
1147350	52 - 22
1147385	53 - 2
1147387	53 - 2
1148310	1 - 26
1148451	44 - 38A
1148453	44 - 38B
1154084	54 - 9
1154336	54 - 17
1158900	44 - 11
1159004	38 - 18
1159007	38 - 28
1159009	38 - 19
1159010	38 - 26
1159015	38 - 32
1159016	38 - 25
1159017	38 - 30
1159023	38 - 53
1159024	38 - 33
1159026	38 - 29
1159027	38 - 27
1159033	57 - 25
	57A- 24
1159097	41 - 8
1159109	52 - 41
1159112	14 - 12
1159113	57 - 25
	57A- 24
1159117	7 - 7A
1159129	43 - 76A
	43 - 89
	43 - 89
1159139	55 - 41
1159141	55 - 40
1159150	57 - 37
1159154	57A- 35
1159155	50 - 25
1159157	49 -106
1159171	46 - 50
1159173	46 - 45
1159175	58 - 58
1159179	57 - 39
	57A- 37
1159182	46 - 46
1159185	46 - 47
1159189	57 - 39
	57A- 37
1159194	1 -180
1159202	1 -150
1159203	1 -170
1159204	1 -175
1159205	1 -173
	39 - 11
1159207	1 -176
1159208	1 -179
1159209	1 -177
1159218	16 - 13
1159220	2 - 53
1159239	43 - 72A
1159240	5 - 89
	43 - 83
1159241	43 - 73
1159244	5 - 47
	43 - 84
1159246	5 - 48
1159249	57 - 27
	57A- 25
1159262	52 - 80
1159267	8 - 22
1159269	8 - 23

PART NO.	LIST AND INDEX NO.
1159269-CONT	9 - 56
1159286	4 - 54
1159295	31 - 1
	32 - 1
1159301	5 - 33
1159306	5 - 56
1159307	5 - 57
1159308	5 - 41
1159312	5 - 42
1159319	57 - 29A
	57A- 27
1159321	4 - 68
1159327	4 - 32
1159334	4 - 67
1159335	4 - 60
1159336	4 - 63
1159338	53 - 28
1159350	41 - 3
1159352	39 - 2
1159353	32 - 1
1159420	38 - 31
1159443	43 - 72
1159472	57 - 36
	57A- 34
1159473	57 - 36
	57A- 34
1159474	57 - 34
	57A- 32
1159475	57 - 31
	57A- 29
1159476	57A- 35
1159485	3 - 62
1159504	58 - 69
1159507	36 - 88
1159519	58 - 23A
1159536	12 - 14
1159542	18 - 12
	19 - 16
1159545	48 - REF
1159549	31 - 7
1159553	54 - 31
1159554	54 - 31
1159557	54 - 32
1159558	18 - 9
	19 - 12
1159560	54 - 33
	54 - 33
1159561	54 - 34
1159562	54 - 35
1159565	54 - 36
1159567	54 - 37
1159571	54 - 39
	54 - 39
1159572	54 - 40
1159573	54 - 41
	54 - 61
1159575	2 - 86
1159578	54 - 42
1159581	54 - 43
1159582	54 - 43
1159584	54 - 44
1159585	54 - 44
1159589	19 - REF
1159593	54 - 45
1159594	54 - 46
1159596	54 - 47
1159598	54 - 48
1159626	54 - 50
1159627	54 - 49
1159628	54 - 51
1159629	54 - 52
1159630	54 - 53
1159632	54 - 54
1159633	54 - 55
1159634	54 - 55
1159635	54 - 56
1159636	54 - 57
1159637	58 - 61
1159650	40 - 42
1159651	54 - 58

PART NO.	LIST AND INDEX NO.
1159652	54 - 58
1159654	9 - 19
1159669	51 - 37A
1159674	9 - 20
1159682	59 - 23
1159716	6 - 13
	46 - 13
1159754	54 - 59
1159756	54 - 60
1159761	54 - 63
1159779	58 - 62
1159780	58 - 58
1159781	58 - 63
1159787	49 -111
1159790	49 - 70
1159810	38 - 27
1159818	4 - 65
1159833	6 - 16
1159842	6 - 20
1159843	8 - 7
	9 - 28
	35 - 29
1159844	8 - 8
	9 - 29
1159880	17 - 9
1159886	8 - 24
1159891	40 - 57
1159893	40 - 58
1159894	40 - 43
1159895	52 - 7
1159898	49 -112
1159908	36 - REF
1159913	59 - 22
1159927	32 - 3
1159936	40 - 17
	54 - 76
1159937	7 - 7
1159938	7 - 8
1159939	8 - 42
	9 - 42
1159940	7 - 9
1159941	7 - 10
1159942	5 - 59
1159945	6 - 21
1159947	5 - 60
1159948	8 - 16
	9 - 38
1159949	5 - 61
1159950	5 - 86
1159951	7 - 11
1159952	5 - 63
1159953	7 - 12
1159954	5 - 87
1159955	8 - 21
	9 - 39
	46 - 21
1159956	7 - 13
1159957	7 - 14
1159958	6 - 22
1159959	7 - 5
1159960	5 - 20
1159961	7 - 4
1159963	7 - 15
1159964	8 - 17A
	9 - 40
1159965	8 - 20A
	9 - 41
1159966	7 - 16
1159967	7 - 17
1159972	47 - 12
1159973	47 - 13
1159974	47 - 14
1159975	47 - 15
1159978	47 - 16
	48 - 22
1159993	51 - 1A
1159994	51 - 2
1160090	2 - 87
1160777	27 - 12
1164039	36 - 96

PART NO.	LIST AND INDEX NO.
1164044	36 - 81
1164045	49 - 84
1164047	35 - 15
1164080	44 - 3
1164084	2 -137
1164089	49 - 82
	49 -123
1164099	36 -132
1164101	54 - 77
1164102	54 - 78
1164109	46 - 34
1164127	2 -126
1164151	36 -146
1164153	36 - 37
1164158	36 -133
1164160	2 - 54
1164171	4 - 74
1164177	2 - 88
1164187	4 - 3
1164218	36 -110
1164220	37 - 28
1164236	37 - 29
1164237	37 - 31
1164239	37 - 30
1164240	36 -106
1164241	37 - 32
1164285	36 -136
1164290	36 -137
1164316	49 - 90
1164342	1 - 15
1164380	2 - 89
1164381	2 - 90
1164384	58 - 84
1164431	44 - 3A
1164433	43 - 61A
1164435	36 -137A
1164463	31 - 7
1164464	31 - 7
1164476	31 - 8
1164489	33 - 45
1164499	2 - 55
1164548	36 - 44
1164550	36 - 42
1164555	37 - 7
1164561	1 - 16
1164563	36 - 79
1164574	44 - 3A
1164576	1 - 78
	1 - 79
	1 -103
	4 - 37
	11 - 39
	12 - 15
	23 - 19
	24 - 22
	28 - 24
	33 - 46
	35 - 8
	39 - 16
	43 - 16
	43 - 23
	44 - 21
	45 - 39
	46 - 41
	49 -113
	52 - 49
	52 - 51
	52 - 70
	58 - 65
	59 - 23A
1164577	1 -197
	2 - 56
	5 - 88
	6 - 30
	8 - 9
	9 - 30
	16 - 17
	40 - 36
	45 - 6
	47 - 24

PART NO.	LIST AND INDEX NO.
1164577-CONT	50 - 28
	52 - 38
	58 - 66
1164578	5 - 67
	6 - 24
	7 - 18
	22 - 11
	23 - 17
	24 - 21
	25 - 17
	25 - 21
	27 - 13
	28 - 15
	33 - 47
	38 - 13
	38 - 60
	39 - 35
	40 - 60
	43 - 82
	49 -114
	52 - 90
1164579	1 - 23A
	3 - 6
	23 - 18
	24 - 6A
	25 - 9
	29 - 11
	35 - 33
	44 - 14
	46 - 5
	49 -128
	54 - 8A
1164580	7 - 19
	10 - 17
	14 - 14
	28 - 28
	30 - 11
	36 -139
	37 - 33
	38 - 50
	38 - 62
	39 - 37
	48 - 8
	49 -115
	54 - 80
	57 - 22
	57A- 21
1164582	2 - 57
	4 - 85
	6 - 25
	17 - 32
	18 - 13
	19 - 17
	36 -140
	43 - 41
	46 - 3
	46 - 60
	52 - 79
	54 - 81
	56 - 6
	56 - 30
1164583	17 - 7
	44 - 37
1164584	46 - 58
	48 - 4
	52 - 66
1164600	37 - REF
1164619	39 - 27
1164652	40 - 38
1164666	54 - 64
	54 -103
1164676	39 - 10
1164690	20 - 15
	52 - 72
1164697	2 - 50
1164698	2 - 49
1164721	43 - 58A
1164724	3 - 36
1164738	41 - 17
1164739	41 - 1

PART NO.	LIST AND INDEX NO.
1164740	41 - 12
1164760	40 - 18
	45 - 12
1164761	45 - 1
1164775	49 -116
1164791	41 - 18
1164799	4 - 41
1164845	43 - 57A
1164847	43 - 62B
1164849	43 - 56A
	43 - 61B
1164850	31 - 5
1164859	2 -121
1164940	25 - 11
1164991	9 - 56
1166001	49 - 64
1166025	6 - 4
1166036	59 - 23
1166039	59 - 4C
1166041	12 - 16
1166049	45 - 18
1166053	47 - 18
	48 - 17
1166088	46 - 11
1166089	1 -102
1166099	54 - 82
1166102	36 -105
1166115	59 - 8
1166135	2 -120
1166143	1 -147A
1166152	13 - REF
1166153	13 - 14
1166154	13 - 15
1166164	36 -141
1166187	47 - 25
	48 - 15
1166188	13 - 16
	35 - 14
1166191	54 - 83
1166203	47 - 19
1166212	4 - 66
1166214	4 - 20
1166217	8 - 26
	9 - 48
1166228	51 - 34
1166230	9 - 21
1166231	9 - 22
1166298	58 - 23
1166301	1 -195
1166304	6 - 26
1166311	51 - 18
1166315	51 - 15
1166331	6 - 14
1166332	6 - 15
1166333	6 - 19
1166334	6 - 18
1166335	6 - 17
1166336	6 - 23
1166337	6 - 27
1166338	6 - 28
1166342	51 - 35
1166343	5 - 29
1166362	52 - 61
1166363	52 - 56
1166366	9 - 17
1166367	52 - 54
1166368	52 - 48
1166372	9 - 37
	9 - 57
1166373	9 - 58
1166377	52 - 59
1166380	52 - 57
1166381	52 - 63
1166385	52 - 58
1166414	1 - 1
1166415	4 - 2
1166431	58 - 26
1166436	43 - 10
1166437	43 - 7
1166440	43 - 6

PART NO.	LIST AND INDEX NO.
1166498	59 - 17
1166516	1 - 30
1166517	1 - 31
1166544	2 - 91
1166547	47 - 11
1166548	47 - 12
1166551	51 - 39
1166553	51 - 38
1166554	51 - 40
1166555	9 - 23
1166557	52 - 53
1166558	51 - 33
1166559	9 - 49
	9 - 59
1166560	49 -117
1166598	51 - 17
1166606	7 - 7
1166618	52 - 46
1166619	1 - 77
1166626	51 - 4
1166671	3 - 65A
1166706	1 -155
1166713	1 -154
1166714	1 - 26
1166761	3 - 39A
	53 - 25A
	53 - 29A
1166762	4 - 40A
	53 - 28A
1166763	1 -192A
	33 - 48
1166764	28 - 16
1166765	3 - 61A
1166769	53 - 26A
1166770	5 - 72
	35 - 21
	50 - 26
	52 - 42A
1166777	49 - 83
1166779	49 - 94
1166847	55 - 49
1166938	57 - 17
	57A- 16
1166976	31 - 3
1166977	31 - 3
1166992	31 - 3
1166998	58 - 78A
1166999	58 - 78B
1167001	42 - 3
1167005	42 - 3
1167006	42 - 3
1167007	42 - 3
1167008	42 - 3
1167010	42 - 3
1167012	42 - 3
1167014	42 - 3
1167015	42 - 3
1167016	42 - 3
1167019	42 - 3
1167020	42 - 3
1167029	42 - 3
1167030	42 - 3
1167043	42 - 3
1167050	42 - 3
1167070	42 - 3
1167072	42 - 3
1167087	42 - 3
1167090	42 - 3
1167640	42 - 3
1167733	42 - 3
1167822	42 - 3
1167823	42 - 3
1167824	42 - 3
1167825	42 - 3
1167826	42 - 3
1167827	42 - 3
1167828	42 - 3
1167829	42 - 3
1167830	42 - 3
1167832	42 - 3

PART NO.	LIST AND INDEX NO.
1167834	42 - 3
1167835	42 - 3
1167837	42 - 3
1167839	42 - 3
1167840	42 - 3
1167844	42 - 3
1167938	42 - 3
1167939	42 - 3
1167940	42 - 3
1167941	42 - 3
1167942	42 - 3
1167943	42 - 3
1167947	42 - 3
1167948	42 - 3
1167961	42 - 3
1167962	42 - 3
1167963	42 - 3
1167964	42 - 3
1167970	42 - 3
1167986	42 - 3
1167996	42 - 3
1167997	42 - 3
1167998	42 - 3
1171811	31 - 7C
1172772	2 -133
1173356	58 - 87
1174011	36 -147
1174096	58 - 83
1174099	49 - 87B
1174106	4 - 77
1174160	49 -129
1174181	9 - 3
1174207	5 - 21
1174427	36 -134
1174485	9 - 52
1175100	2 - 11
1175101	1 -106
	3 - 10
	4 - 64
	31 - 7B
	33 - 9
	36 - 13
	40 - 6
	57 - 5
	57A- 5
1175102	2 - 58
	36 - 14
	51 - 36
1175103	9 - 32
	9 - 60
	41 - 2
	52 - 43
	52 - 62
	53 - 14
1175104	36 - 43
	57 - 3
1175107	3 - 38
	9 - 5
	31 - 2
	33 - 2
	40 - 37
	45 - 2
	45 - 4
	51 - 14
	52 - 26
	58 - 22
1175132	37 - 12
1175133	37 - 14
1175197	36 -131
1175198	4 - 7A
1175199	4 - 6
1175220	41 - 16
1175236	2 - 59
1175237	2 - 60
1175243	9 - 10
1175268	51 - 22
1175352	36 -102A
1175422	32 - 3
1175423	32 - 3
1175545	46 - 64

PART NO.	LIST AND INDEX NO.
1175577	31 - 10
1175616	46 - 63
1175803	36 - 35
1175865	41 - 3
1175866	41 - 4
1175868	41 - 7
1176506	58 - 23
1176508	59 - 16
1176511	59 - REF
1176513	20 - REF
1176514	20 - 13
1176515	53 - 44
1176516	58 - 80
1176562	58 - 23
1176563	59 - 16A
1176589	29 - REF
1176590	29 - 10
1176591	44 - 7B
1176594	3 - 25
1176596	3 - 17
1176653	58 - 23
1176707	54 - 8
1176734	58 - 23
1176778	58 - 23
1176804	36 - REF
1176807	5 - REF
1176813	55 - 10
	55 - 14
	55 - 15
	55 - 16
	55 - 17
	55 - 18
	55 - 19
	55 - 20
1176814	55 - 11
1176815	55 - 12
1176816	55 - 13
1176817	55 - 14
1176818	55 - 15
1176819	55 - 16
1176820	55 - 17
1176821	55 - 18
1176822	55 - 19
1176823	55 - 20
1176825	55 - 21
1176826	36 -123
1176827	36 -125
1176828	55 - 22
1176829	55 - 23
1176830	55 - 24
1176831	55 - 25
1176832	55 - 26
1176834	55 - 27
1176835	55 - 28
1176836	55 - 29
1176837	55 - 30
1176838	55 - 31
1176839	55 - 32
1176841	55 - 33
1176843	14 - REF
1176844	14 - 13
1176845	44 - 22
1176847	43 - 90
1176848	43 - 93
1176851	43 - 77A
1176852	2 - 92
1176855	2 - 93
1176856	54 - 84
1176857	54 - 87
1176858	40 - 14
	44 - 23
1176859	53 - 43
1176860	53 - 44
1176863	3 - 48
1176864	55 - 34
1176868	40 - 33
1176871	44 - 19
1176872	52 - 27
1176876	46 - 55
1176879	46 - 59

PART NO.	LIST AND INDEX NO.
1176884	46 - 57
	52 - 91
1176885	52 - 89
1176886	46 - 56
1176887	46 - 16
1176890	46 - 7
1176891	58 - 81
1176892	58 - 70
1176895	58 - 71
1176896	58 - 72
1176897	58 - 73A
1176898	58 - 74
1176899	58 - 75
1176900	22 - REF
1176901	22 - 12
1176902	45 - 38
1176904	53 - 39
1176906	3 - 25
1176910	58 - 76
1176920	3 - 49
1176922	44 - 17
1176925	55 - 35
1176926	55 - 36
1176927	55 - 37
1176928	55 - 31
	55 - 32
	55 - 38
	55 - 38
1176929	59 - REF
1176932	17 - REF
1176934	2 - 94
	32 - 22
1176935	2 - 95
	32 - 23
1176939	55 - 39
1176943	54 - 60
1176945	54 - 88
1176948	18 - REF
1176949	18 - 10
	29 - 8
	30 - 8
1176950	54 - 59
1176951	54 - 63
1176952	54 - 62
1176975	22 - 13
1176988	54 - 88
1176990	52 - 54
1176998	3 - 45
1177112	17 - 1
1181240	50 - 18D
1186016	54 -109
1186017	54 -110
1186018	54 -111
1186020	54 -121
1186022	55 - 28
1186023	55 - 29
1186024	55 - 27
1186025	34 - 4
1186026	34 - 2
1186027	34 - 1
1186028	34 - 3
1186029	34 - 6
1186030	34 - 7
1186031	34 - 5
1186033	3 - 15
1186036	44 - 7B
1186037	44 - 7B
1186038	44 - 7B
1186048	30 - REF
1186051	30 - 10
1186099	55 - 9
1186101	34 - REF
1187000	49 -131
1187001	5 - 73
	49 - 97A
	49 -122
1187002	5 - 74
1187003	5 - 75
1187004	38 - 13C
1187005	49 - 87A

PART NO.	LIST AND INDEX NO.
1187006	4 - 20A
1187030	5 - 31
1187034	17 - 9
1187035	17 - 10
1187036	17 - 11
1187037	17 - 12
1187038	17 - 13
1187095	49 - 38A
1187099	58 - 26
1187114	41 - 13
1187119	58 - 68
1187121	58 - 65
1187139	2 -121
1187141	1 - 73
1187146	4 - 88
1187148	58 - 35
1187150	3 - 66
1187152	25 - 10
	47 - 20
1187163	5 - 76
	25 - 7
1187168	5 - 42A
1187175	1 -127
1187181	5 - 90
1187193	5 - 27
1187195	5 - 32
1187198	44 - 28
1187203	52 - 67
1187204	52 - 58
1187205	40 - 30
	45 - 3
	52 - 25
1187206	52 - 73
1187207	11 - 32
1187212	11 - REF
1187219	55 - 20
1187220	55 - 18
1187221	55 - 13
1187222	9 - 2
1187223	3 - 47
1187224	58 - 82
1187230	53 - 18
1187231	53 - 21
1187233	53 - 22
1187234	53 - 27
1187235	52 - 58A
1187236	1 - 41
	1 -181
1187238	50 - 17D
1187239	44 - 31
1187245	33 - 49
1187248	59 - REF
1187249	57 - 29
1187250	57A- 36
1187255	54 - 88
1187257	35 - 35
1187258	35 - 36
1187259	56 - 20
1187260	56 - 22
1187261	56 - 21
	56 - 22
1187263	54 - 68
1187264	54 - 69
1187265	54 - 70
1187266	54 - 71
1187267	54 - 72
1187269	56 - 2
1187270	56 - 1
1187271	56 - 4
1187273	56 - 3
1187289	33 - 3
1187291	57 - 16
1187292	57 - 23
1187293	53 - 28
1187294	53 - 15
1187296	54 - 59
1187297	54 - 63
1187299	2 - 88
1187300	54 - 74
1187301	57 - 36

PART NO.	LIST AND INDEX NO.
1187305	57 - 4
	57A- 4
1187307	57 - 2
1187309	33 - 10
1187312	33 - 50A
1187313	33 - 50B
1187314	33 - 50
1187315	33 - 52
1187320	33 - 11
1187321	33 - 15
1187324	33 - 19
1187325	33 - 20
1187326	33 - 21
1187327	33 - 22
1187328	33 - 23
1187329	33 - 24
1187330	56 - 9
1187331	33 - 25
1187332	33 - 26
1187333	33 - 27
1187334	33 - 28
1187335	33 - 29
1187336	33 - 30
1187337	33 - 31
1187338	33 - 32
1187339	33 - 33
1187340	28 - 17
	33 - 53
1187341	33 - 54
1187342	2 - 77
1187343	2 - 78
1187345	2 - 78
1187346	2 - 77
1187348	2 - 88
1187349	33 - 55
1187350	33 - 56
1187351	35 - 32
1187354	35 - 27
1187355	28 - 25
1187356	35 - 24
1187362	1 -196
1187364	35 - 22
1187366	35 - 23
1187367	35 - 19
1187368	58 - 73
1187369	58 - 71
1187370	54 - 75
1187378	35 - 7
1187380	35 - 9
1187383	35 - 13
1187384	27 - 14
1187385	27 - 15
1187386	27 - REF
1187387	9 - 61
1187388	9 - 62
1187390	9 - 63
1187391	9 - 64
1187392	28 - 18
1187393	56 - 23
	56 - 26
1187394	2 -121
1187400	52 - 59A
1187403	3 - 52
1187404	1 - 34
	3 - 53
1187406	1 - 73
	56 - 14
1187408	52 - 1
1187410	52 - 2
1187412	52 - 3
1187414	58 - 62
1187415	35 - 5
1187416	5 - 42B
	50 - 17A
	50 - 18A
1187423	5 - 92
1187426	1 - 27C
1187427	1 - 27E
1187428	1 - 27B
1187429	1 - 27

PART NO.	LIST AND INDEX NO.
1187430	1 - 39
1187431	1 - 40
1187432	1 - 32
1187433	1 - 33
1187434	1 -151
1187435	1 - 25
1187448	2 -111
1187449	53 - 23
1187450	56 - 2
1187453	56 - 20
1187455	28 - REF
1187456	28 - 19
1187457	28 - 20
1187459	28 - 21
1187460	28 - 22
1187462	35 - 2
1187464	57 - 39
1187465	57 - 39
1187467	57 - 31
1187468	57 - 34
1187469	57 - 27
1187470	57 - 35
	57A- 33
1187471	57 - 30
	57A- 28
1187472	57 - 28
	57A- 26
1187473	57 - 36
1187475	57 - 15
	57A- 14
1187478	56 - 29
1187479	56 - 5
1187480	56 - 17
1187481	56 - 18
1187482	56 - 33
1187483	56 - 34
1187485	56 - 7
1187486	56 - 31
1187489	57 - 38
1187490	33 - 34
1187493	54 - 75
1187499	58 - 81
1187502	8 - 20
	9 - 41A
1187503	9 - 50
1187509	54 - 45A
1187514	5 - 80
	5 - 80A
1187515	5 - 81
1187516	5 - 79
1187517	5 - 81A
1187518	43 - 93
1187521	13 - 17
1187539	52 - 88
1187578	11 - REF
1187584	54 - 20
1187595	1 -115
1187597	1 -115
1187599	39 - 5
	39 - 9
1187613	59 - REF
1187615	17 - REF
1187616	55 - 43
1187617	55 - 42
1187618	55 - 50
1187621	54 - 63
1187624	55 - 46
1187642	9 - 48
1187643	9 - 43
1187644	9 - 46
1187648	9 - 45
1187650	9 - 47
1187651	9 - 36
1187652	9 - 35
1187654	5 - 50
1187658	52 - 77
1187662	52 - 55
1187665	57 - 1
	57A- 1
1187668	39 - 9

PART NO.	LIST AND INDEX NO.
1187673	32 - 3
1187674	32 - 3
1187699	13 - 15C
1187730	58 - 23
1187732	58 - 23
1187733	58 - 23
1187735	58 - 23
1187745	58 - 23
1187749	58 - 23
1187751	58 - 23
1187753	58 - 23
1187760	54 - 70
1187762	54 - 71
1187763	54 - 72
1187764	54 -107
1187765	54 -108
1187767	54 - 63
1187769	55 - 56
1187770	55 - 55
1187771	55 - 57
1187772	55 - 58
1187775	55 - 51
1187777	55 - 24
1187778	54 - 63
1187781	57 - 24
1187783	57 - 36
	57A- 34
1187784	57 - 37
1187794	40 - 43
1187833	35 - 25
	57 - 11
	57A- 10
1187845	35 - 3
1187873	53 - 38
1187884	48 - 11
1187886	57 - 39
	57A- 37
1187914	2 - 61
1187968	51 - 37
1187986	54 - 59
1202646	13 - 20
1203177	54 -100
1203178	54 - 94
1203179	54 -101
1203200	57 - 37
1203201	57 - 24
1203202	57 - 24
1203203	57 - 30A
	57A- 28A
1203204	57 - 32
	57A- 30
1203214	49 - 97
1203215	49 - 98
1203218	49 -126
1203228	53 - 39
1203229	3 - 70
1203230	3 - 71
1203232	48 - 12
1203233	48 - 14
1203235	3 - 25
1203236	3 - 25
1203239	44 - 12
1203255	49 -110
1203271	52 - 64
1203288	58 - 26
1203289	49 -124
1203290	49 -127
1203293	49 -126
1203295	58 - 26
1203297	49 -133
1203298	49 -125
1203321	49 - 74
1203322	49 -103
1203351	59 - 26
1203352	59 - 24
1203364	41 - 8
1203373	53 - 31
1203446	49 -109
1203488	54 -112
1203489	54 -115

PART NO.	LIST AND INDEX NO.
1203490	54 -114
1203491	54 -117
1203492	54 -113
	54 -116
1203527	4 - 84
1203556	49 -107
1203557	1 -105
1203582	53 - 54
1203588	53 - 4
1203589	53 - 4
1203608	27 - 8
1203611	25 - 12
1203612	15 - REF
1203615	31 - 7A
1203620	25 - 13
1203623	25 - 20
1203624	25 - 30
1203625	2 - 20
1203630	25 - 5
1203631	2 -129
1203634	2 -132
1203639	25 - 6
1203640	25 - 4
1203644	2 -127
1203650	2 -131
1203717	9 - 40A
1203726	53 - 53
1203727	53 - 53
1203736	32 - 20
1203737	32 - 8
1203738	32 - 8
1203742	32 - 14
1203743	32 - 6
1203744	32 - 18
1203745	32 - 12
1203747	32 - 5
1203780	32 - 18
1203781	32 - 17
1203782	32 - 19
1203785	32 - 26
1203846	6 - REF
1203849	6 - REF
1203850	6 - REF
1203855	6 - REF
1203862	36 - 93
1203863	36 - 45
1203868	57A- 15
1203869	57A- 22
1203870	57A- 23
1203871	57A- 23
1203872	57A- 23
1203874	54 - 59
1203876	32 - 3
1203877	32 - 3
1203887	58 - 69
1203906	50 - 12
1203907	50 - REF
1203934	32 - 20
1203935	32 - 20
1203936	32 - 20
1203937	32 - 20
1203938	32 - 20
1203939	32 - 20
1203940	32 - 20
1203941	32 - 20
1203942	32 - 20
1203943	32 - 20
1203944	32 - 20
1203945	32 - 20
1203946	32 - 20
1203952	7 - REF
1203959	7 - REF
1203964	7 - REF
1203965	7 - REF
1230142	58 - 88
1262789	38 - 63
1263006	58 - 78
1266829	46 - 61
1266830	51 - 27
1266879	3 - 1
1266880	3 - 1
1266881	3 - 1
1272007	38 - REF
1272076	32 - 27
1272078	32 - 27
1272176	36 -145
1272675	8 - 3
	9 - 24
1272679	44 - 1
	51 - 1
1272709	40 - 39
1272913	51 - 37
1272914	51 - 27
1272915	8 - 10
	9 - 31
1272962	9 - 50A
1274548	32 - 26
1275643	1 -200
1277102	59 - REF
1277105	17 - REF
1277107	55 - 12
1277113	54 - 88
1277187	55 - 11
1277188	55 - 13
1277189	54 - 92
1277192	54 - 97
1277195	17 - 35
1277196	7 - 7
1277197	54 - 98
1277198	54 - 99
1277203	54 - 93
1277207	55 - 27
1277208	54 -102
1277212	54 - 63
1277393	59 - REF
1280498	36 -130
1280821	51 - 20
1280822	51 - 20
2101657	59 - 2A
2106333	23 - 14
	24 - 20
2114985	36 -143
2122016	59 - 4D
2122035	55 - 53
	56 - 27
2122258	59 - 6
2122260	59 - 6A
2122261	59 - 7
2122471	59 - 18
2122636	59 - 9
2122637	59 - 11
2123028	59 - 12
2123029	59 - 10
2127854	59 - 18A
2127858	59 - 15
2192530	59 - 14
269449	32 - 28
5152734	14 - 12
5173716	17 - REF
5173719	55 - 54
	56 - 28
5173769	58 - 84
5173793	57A- 2
5173794	57 - 6
	57A- 6
5173811	58 - 34
5319912	58 - 79
5352967	59 - 21
5363690	28 - 23
5363960	57 - 20
	57A- 19
5412642	59 - 25
5412643	59 - 27
5800610	59 - 19
5992841	9 - REF
5992847	9 - REF
5992869	58 - 69
5992871	58 - 69
6512356	2 -123
6512614	2 -124
6512615	2 -122

READER'S COMMENT FORM

Selectric Printer for Communication Terminals
Illustrated Parts Catalog

Order No. S123-1008-5

- How did you use this publication?

  As a reference source ☐
  As a classroom text ☐
  As a self-study text ☐

- Based on your own experience, rate this publication . . .

As a reference source:	Very Good	Good	Fair	Poor	Very Poor
As a text:	Very Good	Good	Fair	Poor	Very Poor

- What is your occupation?

- We would appreciate your other comments; please give specific page and line references where appropriate. If you wish a reply, be sure to include your name and address.

- Thank you for your cooperation. No postage necessary if mailed in the U.S.A.

S123-1008-5

YOUR COMMENTS, PLEASE . . .

Your answers to the questions on the back of this form, together with your comments, help us produce better publications for your use. Each reply is carefully reviewed by the persons responsible for writing and publishing this material. All comments and suggestions become the property of IBM.

Please note: Requests for copies of publications and for assistance in using your IBM system should be directed to your IBM representative or to the IBM sales office serving your locality.

Cut Along Line

Fold **Fold**

FIRST CLASS
PERMIT NO. 569
RESEARCH TRIANGLE PARK
NORTH CAROLINA

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN U. S. A.

POSTAGE WILL BE PAID BY . . .

IBM Corporation
P. O. Box 12275
Research Triangle Park
North Carolina 27709

Attention: Publications Center, Dept. E01

Fold **Fold**

Printed in U. S. A. S123-1008-5

IBM

International Business Machines Corporation

Field Engineering Division

112 East Post Road, White Plains, N. Y. 10601

IBM Selectric

Universal I/O Keyboard Printer

IBM

Parts Catalog

PREFACE

Parts for the following Selectric I/O Printers (keyboard models) are illustrated and listed in this catalog.

1. OP Product, Models 731, 735, 775/MTST
2. 1014
3. 1415 and 7040/7044
4. Sabre
5. Stretch
6. 1620 Model II
7. 765, 767
8. 870
9. 835/2740, 935/2741

Separate illustrations and listings are used for each machine mechanism, e.g., Carrier & Rocker, Selection Pusher Assembly, Covers, etc. In some cases, more than one illustration is required to cover one mechanism.

A complete numeric listing of all parts follows the illustrated catalog section. The listing is made in part number sequence and contains both mechanism codes and parts reference numbers for all items. Refer to the Keyboardless Parts Catalog for Keyboardless machines.

USE OF CATALOG

CONTENTS

The Table of Contents lists page numbers for all machine mechanisms. Location of the mechanism in the Contents, for which a part is required, will provide immediate reference to the correct page.

Parts Which Vary Between Models

Parts listings identify items which have different part numbers for different printer models. A hypothetical example is as follows:

Ref.	Part No.	Description
40	XXXXX	Contact Asm., 1014
40	XXXXX	Contact Asm., 1415
*40	XXXXX	Contact Asm.

*This indicates that all models cataloged, other than 1014 and 1415, use the part number shown where a model is not specified.

Long and Short Carriage Parts

Parts which differ on long and short carriage machines (Series 731, 735, 765, and 767 I/O Printers) are identified in either the listing or the illustration.

1. Listing - The notations (11 inch or 11 inch machine), (15 inch or 15 inch machines), (765 or 765 MLC printer) and (767 or 767 6400 printer) are used to distinguish parts which differ on these models. An example follows:

Ref.	Part No.	Description
77	XXXXXXX	Link - 11 inch
77	XXXXXXX	Link - 15 inch
77	XXXXXXX	Link - 765
77	XXXXXXX	Link - 767

2. Illustration - Where either the appearance or quantity of parts differ radically between corresponding mechanisms of long and short carriage machines, a separate illustration may be used. The separate illustration is enclosed in a bullseye or box and identified as per model.

New and Old Level Parts

New and old level parts may be identified in either the listing or by separate illustration. Separate drawings are used in some cases to differentiate between new and old style parts. New and old style parts appearing under the same reference number are noted as being used on machines above or below an indicated serial number.

Ref.	Part No.	Description
15	XXXXX	Cam - (above 404500*)
15	XXXXX	Cam - (below 404499*)

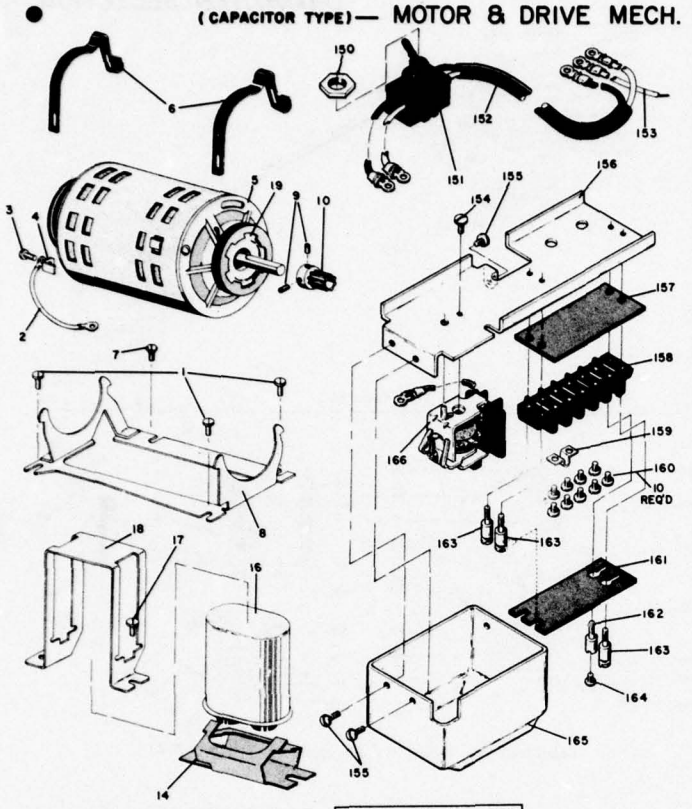
*Serial numbers are approximate.

© International Business Machines Corporation, 1966

CONTENTS

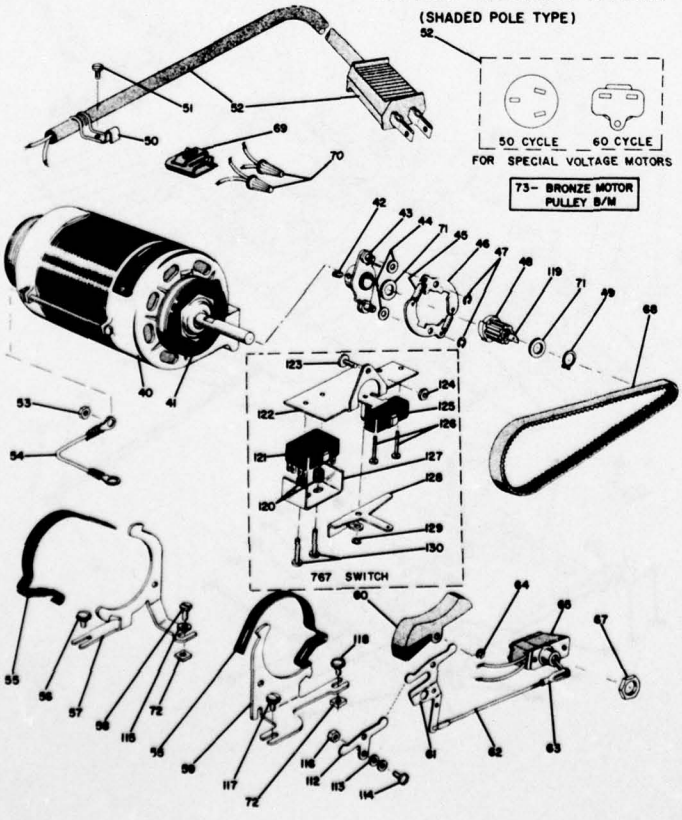
	Page	Code
Preface	I, II	---
Drawings and Listings		
Motor and Drive Mechanism	1	501
Character Selection Mechanism	2	502
Keyboard Selection Mechanism	3-4	503
(Dual Impression) Character Selection	4	503
835-935 Control Buttons and Lights	5	503
Keybuttons	6-7	503
Cam Shaft Assembly (Character Selection)	8	504
Print Feedback and Lever Contact Assemblies	8	504
Selection Pusher Assembly	9	505
Selection Contact Assembly	9	506
Selection Magnet Assembly	10	507
Carrier Assembly	11	508
Rocker (Gear Tilt)	11	508
Rocker (Gearless Tilt)	12	508
Operational Shaft Assembly	12-13	510
Operational Bracket Assembly	13	511
Operational Feedback Contact Assembly	14	511
Operational Magnet Assembly	14-15	512
Operational Contact Latch Assembly	15	513
Escapement Mechanism	16	515
Tab Mechanism	16-17	516
Spacebar Mechanism	18	517
Backspace Mechanism	18	518
Carrier Return Mechanism	19	519
Index Mechanism	20	520
Shift Mechanism	21	522
Shift Magnet and Contact Assemblies	22	523
Keyboard Lock Mechanism	23	524
Linelock and Bell Mechanism	23-24	524
Margin Mechanism	25	525
Paper Feed Mechanism	26-27	526
Platen Assemblies	28	527
Ribbon Mechanism	29	529
Red Ribbon Shift Mechanism	29	530
Frame Assembly	30	531
Cable Assemblies	30	533
Cover Mounting Parts	31	534
Cover Assembly and Mounting	31	535
Cover Insulation	32	535
Covers - Tilt Up	32	535
Horizontal Program Unit & Tape	33	536
Horizontal Program Mounting	33	537
Numerical Part Number Index	35	

(CAPACITOR TYPE)— MOTOR & DRIVE MECH.



MOTOR & DRIVE MECH.

(SHADED POLE TYPE)



REF	P/N	SOURCE	DESCRIPTION
1	1164576		SCREW
2	1159637		WIRE GROUND 3 WIRE
3	1928		SCREW, CLIP
4	1263006		CLIP
5	1166082		MOTOR 115V 60CY AC
5	1166083		MOTOR 220/230V 50/60 CY
6	1132508		RETAINER
7	265195		SCREW,MOTOR BRKT
8	1124562		BRACKET,ASM MOTOR
9	1073462		SCREW MOTOR PULLEY
10	1159175		PULLEY 60 CY
10	1159780		PULLEY 50 CY
14	1159781		INSULATOR CAP
16	1159791		CAPACITOR 4 MFD
16	USE 4 MFD CAP TO REPLACE 3 MFD		
16	1107025		CAP 2 MFD
17	1124740		SCREW,NYLON 2 WIRE
17	1117759		SCREW METAL 3 WIRE
18	1159779		BRACKET
18	1159779		BRACKET 835 935
19	1260156		RUBBER RING, R&M
40	1134818		MOTOR 110V 60CY
	ON PRINTERS WITH TILT UP COVERS USE REFERENCE 135		
40	1141325		MOTOR,230V 60CY AC
40	1141327		MOTOR,115V 50CY AC
40	1141328		MOTOR 230V 50CY
41	1141077		RUBBER RING,SP MTR
42	1100523		SCREW, CLUTCH MTG
43	1134741		HUB, MOTOR CLUTCH
44	1035		SPACER NYLON 50CY
44	*1141504		SPACER NYLON 60CY
45	1128490		SPRING PAWL
45	1159132		SPRING, 50CY
46	*1141923		PAWL, MOTOR
46	1159135		PAWL, 50 CY
47	1073418		RETAINER
48	*1159212		PULLEY MOTOR 60CY
48	1159537		PULLEY 50 CY
	*TO REPLACE ANY OF THESE BELOW SN 4077100 OR 4387000 ORDER REF 73.		
49	103689		RETAINER,MOTOR PUL
50	1134822		CLAMP LINE CORD
51	1164576		SCREW
52	1134827		CORD, MOTOR 2 WIRE
52	1164308		CORD 2 WIRE 13 FT
52	1176778		CORD 115V 835 935
52	1176734		CORD 220V 50CY 835 935
52	1124744		CORD, MOTOR 3 WIRE
52	1164309		CORD 3 WIRE 13 FT
52	1176653		CORD 230V 60CY 835 935
52	1141416		CORD,MTR 230V 60CY
52	1076978		CORD,MTR ALL 50CY
52	□1135061		CORD,SABRE ONLY
53	38051		NUT, GROUND WIRE
54	1127055		WIRE,GROUND 3 WIRE
55	1132508		RETAINER
56	1164577		SCREW, MOTOR BRKT
57	1134825		BRACKET LH MTR MTG
58	35665		SCREW MOTOR BRKT
59	1134826		BRACKET RH MTR MTG
60	1124880		KEYBUTTON, GRAY
60	1144940		KEYBUTTON, 767
61	1124410		LEVER,ON-OFF
62	1133520		LINK, ON-OFF
63	1070020		CLEVIS
64	1073418		RETAINER
65	1124811		SWITCH
65	1135014		SWITCH 4 WIRE
65	1135015		SWITCH 4 WIRE WITHOUT TAPER PINS
65	1176895		SWITCH 835 935
67	179743		NUT, SWITCH
68	1124812		BELT, DRIVE
69	1132028		RETAINER WIRE TERM
70	1115061		SOLDERLESS CONNECT
71	1141503		SPACER
	USE END SPACER ON 50CY, USE BOTH ON 60CY		
72	1134829		NUT,MTR BRKT
73	1272045		B/M BRONZE PULLEY
112	1128787		LEVER
113	1124281		SPACER
114	38266		SCREW
115	1104286		WASHER
116	257186		NUT
	□FOR TWIST LOCK PLUG W/O CORD, ORDER PN 624034		
117	322065		SCREW, MTR BRKT
118	35739		SCREW, MTR BRKT
119	1159211		INSERT, MYLAR
120	1133649		SPACER
121	1133713		SWITCH PWR ON
122	1144904		SWITCH BRACKET
123	1164579		SCREW
124	257187		NUT
125	1145361		SWITCH PWR OFF
126	438543		SCREW
127	1144930		COVER POWER SW
128	1144905		PLATE ACTUATING
129	1073418		C-CLIP
130	438554		SCREW
135	1272824		B/M CAP MOTOR 115V 50/60CY 1/35 HP
135	1272655		B/M CAP MOTOR 230V 50/60CY 1/35 HP
138	1272458		B/M MOTOR MTG
150	179743		NUT, SWITCH
151	1176895		SWITCH
152	1176896		INSULATOR TUBING
153	1176897		WIRE
154	1164577		SCREW
155	1117759		SCREW
156	1176899		BRACKET PWR RELAY
157	5319912		INSULATOR PWR RLY
158	317310		TERMINAL STRIP
159	1143227		STRAP CONNECTING
160	55726		SCREW
161	1176910		SHIELD TERMINAL
162	210883		SCREW
163	210884		SCREW
164	210984		SCREW
165	1176898		SHIELD POWER RELAY
166	1176892		RELAY POWER
167	1176891		POWER RELAY ASSEM
168	1176516		TERMINAL BKT ASSEM

REF	P/N	SOURCE	DESCRIPTION

CODE 901
(6400 PRIMARY PRINTER ONLY)

CODE-501

JANUARY 7, 1966

PAGE 2

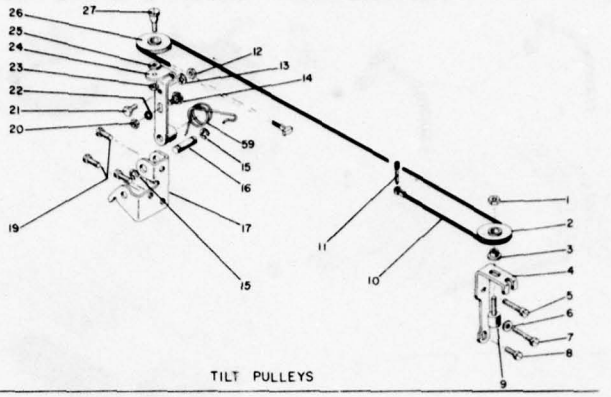
REF	P/N	SOURCE	DESCRIPTION
1	257187		NUT, TILT PULLEY
2	1123749		PULLEY, TILT RH
3	1123750		BUSHING, RH TILT P
4	1124636		BRACKET, RH TILT P
5	38354		SCREW, TILT PULLEY
5	38350		SCREW, TILT PULLEY
	USE WITH SNAP IN DUST SHIELDS		
6	263680		WASHER, RH TILT PU
7	1124683		SCREW, RH TILT PUL
8	38350		SCREW,TILT PULL BK
9	1123751		STUD, RH TILT PULL
10	1144869		TAPE GEAR TILT 767
10	□1145387		TAPE GEARLESS 767
10	1134810		TAPE, TILT 11 IN
10	1134816		TAPE, TILT 15 IN
10	□1164314		TAPE GEARLESS 11IN
10	□1164316		TAPE GEARLESS 15IN
	□GEARLESS TAPE MACHINES BELOW APPROX SN 4604800 B/M 1280498 MUST ALSO BE INSTALLED		
11	1164775		SCREW TAPE ANCHOR
12	38051		NUT STUD TILT
	USED BELOW SN 4010000		
13	62031		WASHER,TILT PUL ST
			USED WITH REF 12
14	1134878		STUD, TILT LINK
15	1092125		RETAINER,TILT ARM
16	1123736		SHAFT, TILT ARM
17	1133565		BRACKET,WEAR COMPE
19	38234		SCREW, BRKT MTG
20	38214		NUT, TILT LINK
21	340191		STUD, TILT LINK
	USED BELOW SN 4010000		
22	56313		WASHER,TILT ARM ST
23	1090268		NUT, TILT PULLEY
24	1132056		ARM, ASM TILT
	MODIFIED USE WITH MODIFIED PULLEY 1123692 AND STUD 1134964		
25	1123696		SPACER, TILT PULL
	USED WITH PN 1123695		
26	1123692		PULLEY, LH TILT
	MODIFIED USE WITH STUD 1134964		
27	1123695		STUD, TILT PULLEY
	USED BELOW SN 4010000 WITH REF 25		
27	1134964		STUD, TILT PULLEY
35	37913		NUT, ROTATE PULL
36	1144871		TAPE ROTATE 767
36	1134811		TAPE, ROTATE 11 IN
36	1134817		TAPE, ROTATE 15 IN
37	NOT AVAILABLE - ORDER REF 51 & 53		
38	NOT AVAILABLE - ORDER REF 51 & 53		
39	1133569		STUD,WEAR COMPENSA
40	38051		NUT,WEAR COMPENSAT
41	62031		WASHER,WEAR COMP
42	1133566		LINK,WEAR COMPENSA
42	1134966		LINK,WEAR COMPENSA
	USE WITH NEW STYLE ROTATE LINK REF 135		
43	1132052		SCREW,WEAR COMPENS
44	1073418		RETAINER,WEAR COMP
45	1133568		ARM, ASM ECC ROTAT
46	1133662		SPRING,ECC ROTATE
47	1133542		SPRING,MIDDLE ROTA
48	133503		WEDGE,WEAR COMP
49	1123702		ECCENTRIC STUD
50	1123704		PULLEY, LH ROTATE
51	1132051		ARM,ASM COMPENSATO
52	1133669		SPRING 11 IN
52	1128087		SPRING 15 IN
52	1128055		SPRING 767
53	1133575		ARM, ROTATE
54	1144939		SPRING COMP 767
54	1141075		SPRING,COMP ASSIST
55	1164576		SCREW DAMPENER 11 INCH
56	1128091		STOP,DAMPER 15 IN
57	1134973		SPRING, DAMPENER
	USE WITH ROTATE ARM REF 37		
57	1141084		SPRING, DAMPENER
	USE WITH ROTATE ARM REF 53		
58	1132100		STOP,DAMPR SPG 11 INCH
59	1141926		SPRING TILT ARM
60	1144666		ANCHOR 767
61	1124157		SCREW ANCHOR 767
71	1133615		SCREW ROTATE LINK
71	1164089		SCREW ROTATE LINK
	USED WITH HEAVY LINK		
72	1127763		NUT HEAVY LINK
72	37913		NUT EARLY LINK
73	1092125		CLIP C TILT DIFF
74	1134837		SPRING, TILT DIFF
75	358174		SCREW LATCH GUIDE
76	47987		NUT, LATCH GUIDE
77	1128556		GUIDE SEL BAIL
78	1128553		PLATE ASM SELECTN
	USED ON MACHINES WITH REF 93		
78	1166001		PLATE ASM
	USED ON MACHINES WITH REF 173		
79	1144796		LINK 767
79	*1134879		LINK, TILT 11 INCH
79	*1134877		LINK, TILT 15 INCH
	*TO INSTALL ON MACHINES BELOW 4010000, USE REF 80 IN FRONT OF LINK AND USE STUD REF 14 TO ATTACH LINK TO TILT ARM.		
80	505071		SPACER, TILT LINK
81	1073418		CLIP C TILT STUD
82	1124821		SHIM DIFF BRACKET
83	1090622		WASHER
	USED WITH OLD STYLE TILT LINK		
84	1856		SCREW LAT GUIDE
85	1138462		NUT, DIFF BRACK ST
86	1135031		BRACKET GUIDE
87	45638		WASHER, GUIDE BRKT
88	1164578		SCREW SEL BKT MTG
89	1164580		SCREW SEL BKT MTG
90	1128557		STUD,SPRING ANCHOR
91	1128580		SPRING, LATCH
92	438541		SCREW CLAMP MTG
93	1128558		ARM, CHECK LATCH
94	110956		SPRING, CHECK LAT,
95	257187		NUT, DIFF BRACK ST
96	358509		WASHER, LOCK
97	47987		NUT, CLAMP MTG SCR
98	1135826		NUT, FIVE UNIT STD
99	1128555		STUD, NEG LATCH

REF	P/N	SOURCE	DESCRIPTION
100	1133668		SPRING, NEG 5 LAT
101	1123718		LATCH, NEG 5 UNIT
102	1128562		GUIDE, LATCH
103	1128563		ARM, PIVOT
104	38051		NUT, ROTATE ARM LK
105	6364		WASHER ROTATE LK
106	1073418		CLIP C ROTATE ARM
107	1133641		DAMPENER, TAPE
108	1159346		BELLCRANK ASM ROT
	ON MACHINES BELOW 4008225 ORDER ROTATE LINK ALSO		
109	1127741		SPACER
110	1127763		NUT LINK SCREW
110	37913		NUT EARLY LINK
111	1123714		STUD ROTATE LINK
112	219633		CLIP C ROTATE
113	1123713		CLEVIS, ROTATE LH
114	6503		NUT ROTATE LINK
115	1128090		LINK ROTATE 15 IN
115	1123721		LINK ROTATE 11 IN
116	1123712		CLEVIS, ROTATE RH
117	1133617		LINK ROT SHORT
117	1164045		LK ROT SHORT-HEAVY
117	1164048		LINK HEAVY 767
118	1135028		LATCH ASM TILT
119	6503		NUT, ROTATE LINK
120	1123741		SCREW ROTATE LEVER
121	1123722		STUD ROTATE ARM
122	1133618		NUT ADJUSTING
123	1135029		LATCH ASM ROTATE
124	332747		CLIP C ROTATE BCRK
125	1133619		NUT, ROTATE LINK
126	1144797		LINK LONG 767
126	1133616		LINK R LONG 11 IN
126	1164047		LINK 11 IN HEAVY
126	1134853		LINK R LONG 15 IN
126	1164048		LINK R LONG 15 IN HEAVY STYLE
127	1133615		SCREW ROT LINK
127	1164089		SCREW HEAVY LINK
128	1116023		WASHER SEL BAIL
129	1134837		SPRING LATCH BAIL
130	1135296		SCREW BAIL PLATE
131	1123725		STUD, NEG 5 LINK
132	1123724		LINK, NEGATIVE 5
133	1073418		CLIP C NEG 5 LINK
134	1123779		SCREW, NEG 5 STOP
135	1159157		BAIL ASM NEG 5
136	38051		NUT NEG 5 STOP PAD
137	1123715		STUD NEG 5 LINK
138	37913		NUT BAIL PLATE RH
139	1159898		SHAFT SEL BAIL
	BELOW SN 4020950 ORDER PN 1141129 AND 1123687		
140	38351		SCREW, BAIL SHAFT
141	1128086		RETAINER,BAIL SHAF
142	1127764		GUIDE, LINK TAB
143	38214		NUT BAIL PLATE LH
144	332747		CLIP C BAIL SHAFT
166	1144867		EXTENSION 767
167	1159341		BAIL
172	1124622		BRACKET GUIDE
173	1159790		ARM PIVOT
174	1159787		SPRING
175	103372		NUT ELASTIC STOP
176	1166560		WICK OIL

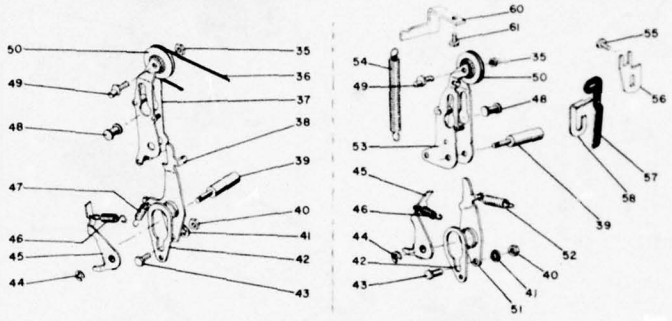
CODE 902
(6400 PRIMARY PRINTER ONLY)

CODE-502

CHARACTER SELECTION

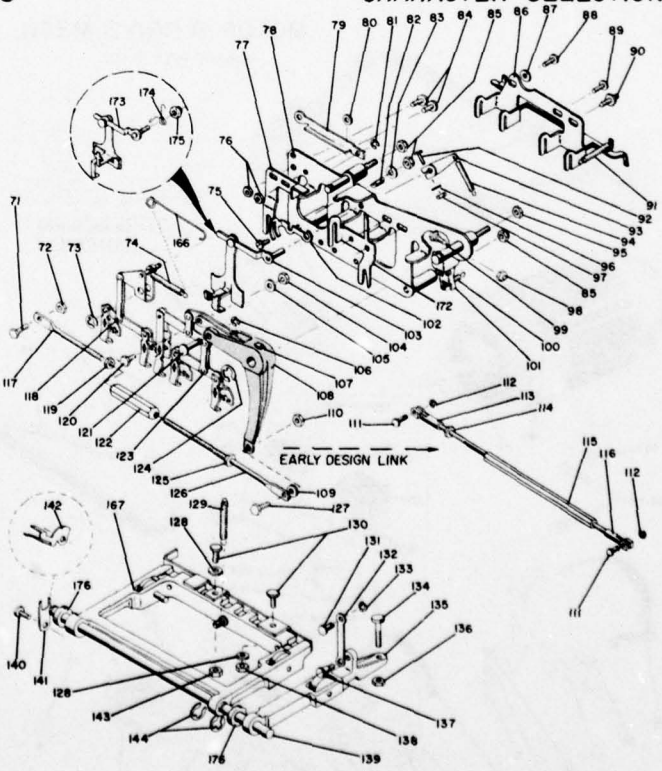


TILT PULLEYS



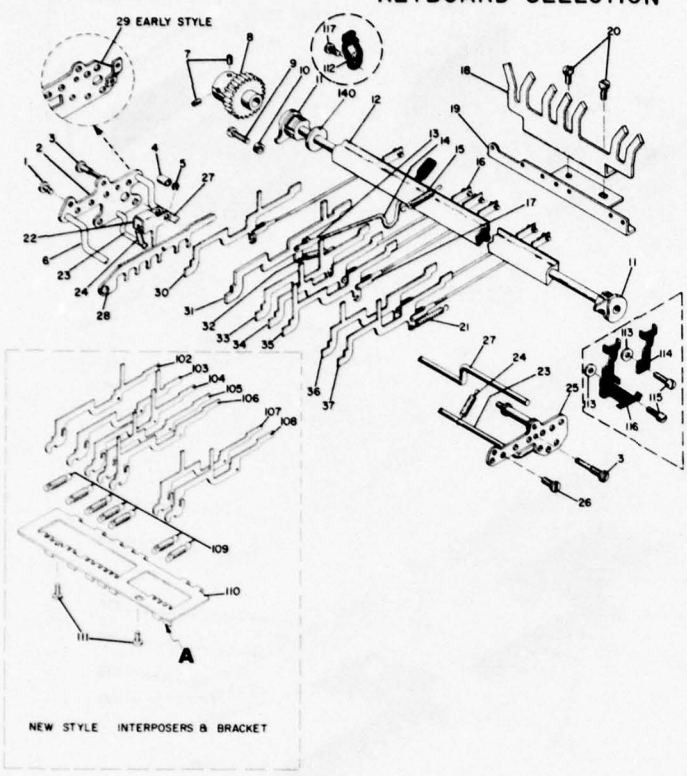
OLD STYLE —— ROTATE PULLEYS —— NEW STYLE

CHARACTER SELECTION

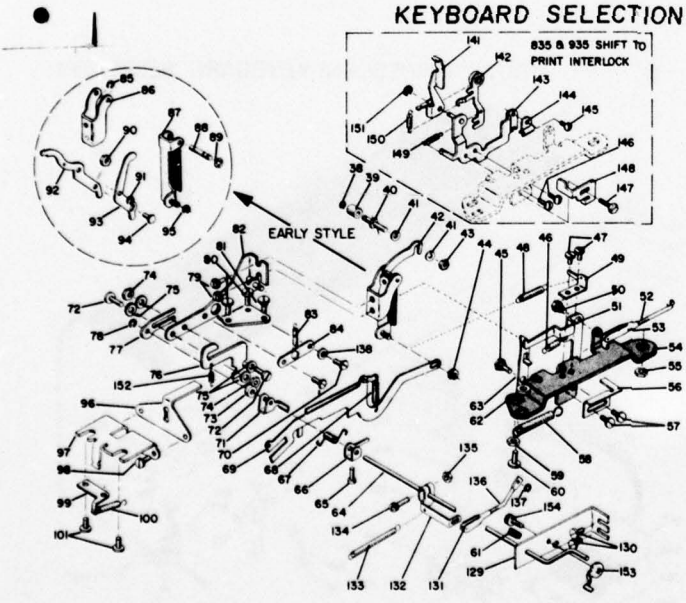


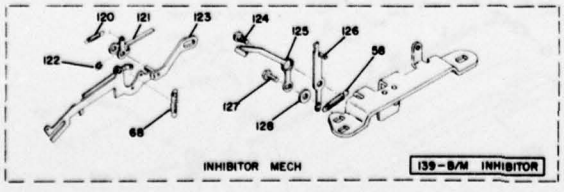
JANUARY 7, 1966

KEYBOARD SELECTION



KEYBOARD SELECTION





REF	P/N	SOURCE	DESCRIPTION
1	1117759		SCREW, BAIL PLATE
2	1135097		PLATE, BAIL LH
3	1132150		SCREW, DAMPER
4	1134784		SPACER, DAMPER
5	219633		CLIP, C DAMPER
6	1123961		BAIL, SELECTION
7	1100523		SCREW, GEAR FILTER
8	1128095		GEAR, FILTER SHAFT
9	322550		SCREW, FILTER SHFT
	USE ON MACHINES BELOW 4074800		
9	1141180		SCREW, FILTER SHFT
10	1141181		SPACER, FILTER SHFT
	USED ON MACHINE ABOVE 4074800		
11	1123677		BEARING, FILTER SH
11	*1141663		BEARING
12	*1141646		SHAFT FILTER
	*USED WITH IMP CONTROL C&R		
12	1123681		SHAFT, FILTER
	USED ON MACHINE BELOW 4064000		
12	1138810		SHAFT, FILTER
13	1070020		CLEVIS, CK LINK
14	1128573		LINK, CK LATCH ITP
15	1071691		SPRING, LATCH LINK
16	1133586		LINK, NEG 5 LATCH
16	1135168		LINK, LATCH
17	1070020		CLEVIS, PIN LATCH L
18	1128636		STOP LATCH INTP
19	1123775		BRACKET, SPRING
20	38350		SCREW, STOP MTG
21	1133670		SPRING, INTERPOSER
22	1134768		DAMPER, CYCLE BAIL
23	1123556		BAIL CYCLE CLUTCH
24	1134831		SPRING, DAMPER
25	1128866		PLATE, BAIL RH
26	1132149		SCREW, BAIL PLATE
27	1135096		BAIL, CHECK
27	REFERENCE ONLY USE PN 1135096 AND 1135097		
28	1133579		STOP, INTPOSER BAI
29	1128868		PLATE BL LH EARLY
30	1123792		INTERPOSER, POS 1
31	1128873		INTERPOSER, CK LAT
32	46831		SPRING CK LAT INTP
33	1123791		INTERPOSER, POS 3
34	1123789		INTERPOSER, POS 4
35	1123787		INTERPOSER, POS 5
36	1123788		INTERPOSER, POS 6
37	1123790		INTERPOSER, POS 7
38	251989		CLIP C, REST CAM
39	1138391		ROLLER REST CAM
40	1138390		STUD, RESTORING CAM
41	1132211		WASHER, REST CAM ST
42	1135124		BRACKET CC LATCH
43	37913		NUT, REST CAM STUD
44	1073418		CLIP C LATCH LINK
45	□1135130		SCREW, PIVOT
46	□1090343		SPRING, LAT. LEVER
47	□1117759		SCREW, BRACKET MTG
48	□1144376		SPRING, CC LATCH
49	□1135127		ANCHOR, SPRING
50	□1135130		SCREW, PIVOT
51	□1135129		LEVER, LATCH
52	□1000223		LINK, CC TRIP
53	□1070020		CLEVIS PIN SMALL
	FOR LATE STYLE REF 52 AND 53 SEE CODE 507		
54	□1135125		*BRACKET, CC TRIP*
55	□ 257187		NUT, BRACKET MTG
56	□1135128		STOP, LATCH
57	□ 265195		SCREW, STOP MTG
58	□ 43373		SPRING TRIP LEVER
59	□ 37913		NUT, BRACKET MTG
60	338238		SCREW BRACKET MTG
61	□1138384		RETAINER, INT BAIL
62	□1128598		SPACER, TRIP BRKT
63	NOT AVAILABLE USE REF 126 □ON MACHINES WITH OLD STYLE CYCLE CLUTCH TRIP MECHANISM ASSEMBLY 1135162 MUST BE USED TO MAKE THE CONVERSION.		
64	1132240		BAIL INTERLK 11 IN
64	1128186		BAIL INTERLK 15 IN
64	1144872		BAIL INTERLK 767
65	2650		SCREW INTERLOCK
66	1134812		LEVER INTERLOCK
67	1134813		SPRING, PAWL INTLK
68	1123827		SPRING, LATCH PAWL
69	1128632		PAWL AND LINK ASM
70	1138369		SCREW, BAIL PLATE
70	265195		SCREW REAR ONLY
	USED ON MACHINES ABOVE SN 4602140		
71	1132241		PAWL, INTERLOCK
71	1164601		PAWL INTERLOCK
	ABOVE SN 4620276		
72	236550		SCREW BAIL PLATE
73	1134867		SPACER, INTERLOCK
74	37913		NUT, SCREW BAIL PL
75	45639		WASHER, BAIL PLATE
76	1134767		STOP, CYCLE BAIL
77	1132242		PLATE, INTLK BAIL
77	1132242		PLATE INTLK BAIL
	ABOVE SN 4620276		
78	1073418		CLIP C
	USED ON MACHINES BELOW 4009650		
79	1138368		SCREW, LATCH BRKT
80	1164576		SCREW, BAIL BRACKET
81	1127733		SCREW, BAIL BRACKET
82	*1123687		BRACKET ASM BAIL
83	1090343		SPRING, RESTORING
84	*1141129		PLATE, BAIL
	*MACHINES BELOW 4020950 REQUIRE REPLACEMENT REF 82, 84 AND BAIL SHAFT 1159898 IF 82 OR 84 IS REPLACED		
85	219633		CLIP C
86	1127791		BRACKET, CY LATCH
87	1128633		LATCH CYCLE CLUTCH
88	1123688		SHAFT, CYCLE LATCH
89	219633		CLIP C LATCH SHAFT
90	37913		NUT, RESTORING SCR
91	219633		CLIP C RESTORING
92	1127787		FOLLOWER LATCH
93	1127790		LEVER, LATCH REST
94	1164582		SCREW, LATCH REST
95	1073418		CLIP C LATCH LINK
96	1134887		KEEPER ASM
97	1135493		BRACKET CY CL KEEP
98	1164582		SCREW, PWL STP MTG
99	1132154		BRACKET, SPRING
	USED ON MACHINES BELOW 4006600		

REF	P/N	SOURCE	DESCRIPTION
100	43373		SPRING PAWL LINK
101	1164576		SCREW, BRACKET
102	1141379		INTERPOSER POS 1
103	1135605		INTERPOSER CK LAT
104	1141378		INTERPOSER POS 3
105	1141376		INTERPOSER POS 4
106	1141374		INTERPOSER POS 5
107	1141375		INTERPOSER POS 6
108	1141377		INTERPOSER POS 7
109	1141383		SPRING INTERPOSER
110	1141382		*BRACKET LAT INT GD*
110	1176902		BRACKET 835 935
111	1164576		SCREW INTP BKT MTG
112	1141894		RETAINER LH
113	1141890		SPACER
114	1159662		RETAINER RH 11 IN
114	1141895		RETAINER RH 15 IN
	ALSO 767 ABOVE SN 4613877		
115	170215		SCREW
116	1141651		RETAINER RH
117	*1164577*		*SCREW*
120	1073449		SPRING INHIBITOR
121	1159171		LEVER INHIBITOR
122	1073418		C-CLIP
123	1128632		LINK CY CL LATCH
124	1159185		SCREW CY CL LEVER
125	1159182		LEVER INHIB TRIP
126	1159173		LEVER CY CL
127	1100951		SCREW INHIB TRP LE
128	1124247		SPACER
129	1144873		SUPPORT 767
130	1164576		SCREW SUPPORT 767
131	1110529		CLEVIS 767
132	1144932		ACTUATOR 767
133	1090341		SPRING 767
134	186924		SCREW 767
135	37913		NUT 767
136	1145364		LINK 767
137	469565		C CLIP 767
138	56722		WASHER
	USED ON MACHINES ABOVE SN 4602140		
139	1272132		B/M INHIBITOR MECH
140	1128146		WASHER
141	1176886		ARM, CC SHIFT INTLK
142	1176876		ARM, CC SHIFT INPUT
143	1176879		PLATE, CC SHFT INLK
144	1176884		CLAMP
145	1164578		SCREW, CLAMP MTG
146	1164582		SCREW, PLATE MTG
147	265195		SCREW, STOP MTG
148	1176887		STOP, SHIFT INTLK
149	1133659		SPRING
150	1133659		SPRING
151	1073418		C-CLIP
152	1128327		SPRING
153	1128216		STOP INTL BAIL
154	186927		SCREW INTL BL STOP

CODE–903
(6400 PRIMARY PRINTER ONLY)

CODE–503

JANUARY 7, 1966

PAGE 4

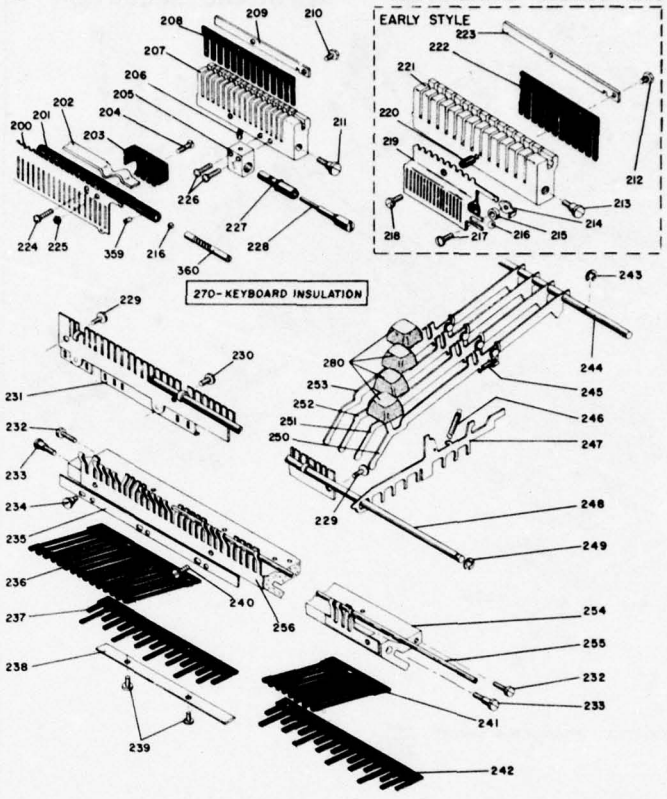
REF	P/N	SOURCE	DESCRIPTION
200□□	1134987		PLATE ASM INT GUI
201□□	1132186		TUBE COMPENSATOR
202□□	1134981		SPACER COMP TUBE
203□□	1134980		CLAMP, COMP TUBE
204□□	438558		SCREW, TUBE CLAMP
205□□	1134990		PLATE, BALL ADJ
206□□	257958		SCREW, ADJ PLATE
207□□	1135495		SUPPORT, FULCRUM
208	1124430		SPRING,LATCH INT
209	1124433		PLATE,INT SPRING
210	1128382		SCREW,LATCH SPRING
211	1134986		SCREW,SUPPORT MTG
212	1128382		SCREW,LATCH SPRING
213	1124732		SCREW,SUPPORT RH
213	1132102		SCREW,SUPPORT LH
214	1134820		STOP,COMB BALL
215	1134821		SPACER, BALL STOP
216	1124682		BALL COMPENSATOR
217	1164580		SCREW, BALL STOP
218	438550		SCREW,COMP TG
219	1133614		COMPENSATOR ASM
220	1133649		SPACER COMP
221	1123956		SUPPORT,FULCRUM
222	1124430		SPRING LATCH INT
223	1124433		PLATE INT SPRING
224□□	1164583		SCREW COMP MTG
225□□	38214		NUT TUBE CLAMP
226□□	1164583		SCREW BALL ADJ PLA
227□□	1134991		TUBE,BALL ADJ RH
227□□	1134992		TUBE,BALL ADJ LH
228□□	1141157		PLUNGER, RH BALL
228□□	1141168		PLUNGER, LH BALL
	□□PARTS USED WITH NEW STYLE SELECTOR COMPENSATOR ABVE 4013400		
229	1164579		SCREW, GUIDE INTER
230	1117759		SCREW, GUIDE INTER
231	1132191		GUIDE COMB INTER
232	1164576		SCREW, SUPPORT MTG
233	1124411		SCREW, KYL GD MTG
234	1164576		SCREW GUIDE COMB
235	1128293		DOWNSTOP,KYL
236	1133647		SPRING, KEYLEV LH
236	1176871		SPRING LH 835 935
237	1133682		COMB, KEYLEVER LH
237	1176922		COMB LH 835 935
238	1133679		PLATE, KYL SPRING
239	1164579		SCREW, SPRING MTG
240	1164576		SCREW, GUIDE COMB
241	1133654		SPRING, KEYLEV RH
242	1133683		COMB, KEYLEVER RH
243	266641		CLIP C FULCRUM
244	1132166		ROD, KYL FULCRUM
245	1132165		SPRING PAWL
246	1141266		SPRING ROW 1 & 2
246	1141267		SPRING, ROW 3 & 4
247	1138900		INTERPOSER, SEL
	USE WITH SHORT PAWL KYLVR. ALSO ORDER APPROPRIATE SPRING REF 246 REMOVE UNDESIRED PROJECTIONS ON INTERPOSERS		
247	1128409		INTERPOSER, SEL
	USE WITH LONG PAWL KEYLEVER.		
248	1123963		ROD, FULCRUM.
249	1092125		CLIP, C FULCRUM
250**	1123950		KEYLEVER ASM, 4TH
250□*	1134892		KEYLEVER ASM, 4TH
251**	1123949		KEYLEVER ASM, 3RD
251□*	1134893		KEYLEVER ASM, 3RD
252**	1123948		KEYLEVER ASM, 2ND
252□*	1134894		KEYLEVER ASM, 2ND
253**	1123947		KEYLEVER ASM, 1ST
253□*	1134895		KEYLEVER ASM, 1ST
	**SHORT PAWL, USED ON 11 IN BELOW 4013400 AND ABOVE 4037900.		
	□*LONG PAWL, USED ON 11 IN BETWEEN 4013400 AND 4037900		
254	1128895		SUPPORT GUIDE COMB
255	1133633		STOP KEYLEVER
256	1123968		COMB KEYLEVER GD
256	1176845		COMB GUIDE 835-935
270	1133637		INSULATION KYBOARD
280	KEYBUTTONS - SEE CHART		
300	1123969		SUPPORT GUIDE COMB
300	1176858		SUPPORT GC 835 935
301	1141666		BRACKET VANE MTG
302	56722		WASHER
303	1117759		SCREW,VANE MTG BKT
304	219633		RETAINER
305	1141894		RETAINER BRGN LH
306	1164577		SCREW
307	1141646		SHAFT FILTER D'
308	1128144		SPACER FILTER SHFT
309	1141663		BEARING
310	1141642		SHIELD LH 11 IN
310	1141649		SHIELD LH 15 IN
311	1141761		CLIP CABLE CENTER
312	1141643		SHIELD RH 11 IN
312	*1159867		SHIELD RH 11 IN
312	1141645		SHIELD RH 15 IN
312	*1159936		SHIELD RH 15 IN
	*USED WITH PERMISSIVE MAKE CONT		
313	1141763		CABLE 11 IN
313	1141765		CABLE 15 IN
314	1141663		BEARING
315	257957		SCREW
316	1141655		CAM LOW VEL SHIFT
317	1164578		SCREW
318	1141782		CAM SHIFT INTL
319	47987		NUT
320	358509		LOCKWASHER
321	1141805		CLAMP CABLE
322	1141651		BRACKET CABLE ANCH
322	1164394		BKT CABLE ANCH 731
323	170215		SCREW
324	1141771		SCREW CABLE ANCHOR
325	1115735		SCREW FOLLOW STOP
326	1141890		WASHER
327	1141780		FOLLOWER LOW VEL
328	1073418		RETAINER
329	1141652		STOP CAM FOL ADJ
330	1071687		SPRING LOW VEL LAT
333	1141650		SPRING LOW VEL FOL
334	1070020		CLEVIS
335	1141647		LINK LOW VEL
336	38566		SCREW
337	1141835		BELLCRANK LOW VEL
338	602229		NUT
339	1141836		VANE LOW VEL
339	1176868		VANE NP 835 935
340	1164578		SCREW
341	1128967		PLATE PIVOT
342	1117759		SCREW MTG
343	438549		SCREW
344	1160777		DIODE

REF	P/N	SOURCE	DESCRIPTION
345	317767		BLOCK TERMINAL
346	317766		INSULATOR TERMINAL
347	1159893		BRACKET MTG
348	1159894		MAGNET ASSEMBLY
349	1159891		LATCH LOW VEL
350	1090630		WASHER
351	1164578		SCREW
352	1127785		SCREW
353	355341		WASHER
354	1128966		BACKSTOP ARMATURE
355	1128965		RESIDUAL ARMATURE
356	1128969		ARMATURE
357	266641		RETAINER
358	1128964		MAGNET ASM
359	1141860		SCREW, SET
360	1141861		PLUNGER
361	1159650		BRACKET LOW VEL
362	38346		SCREW BRKT MTG
363	1073863		SPRING
364	1272709		B/M LOW VEL BLCRNK
365	1164652		SPACER

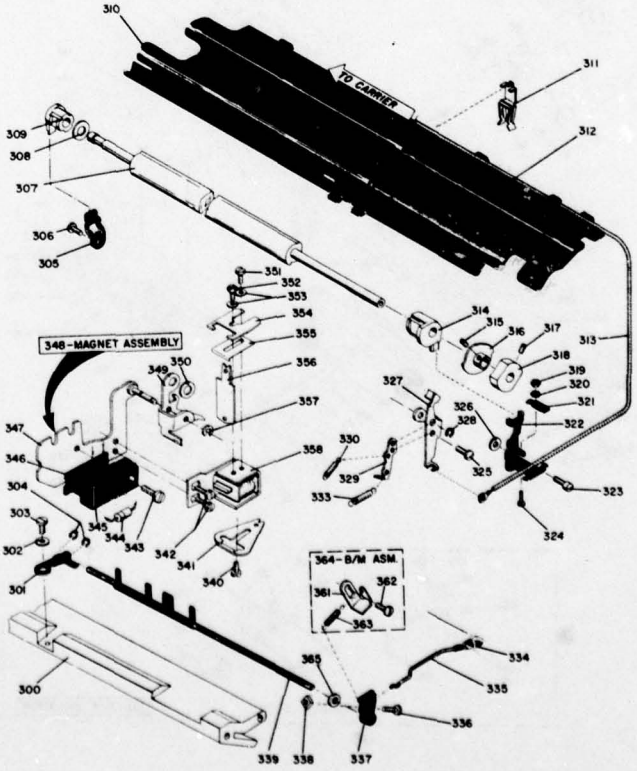
CODE 903
(6400 PRIMARY PRINTER ONLY)

CODE-503

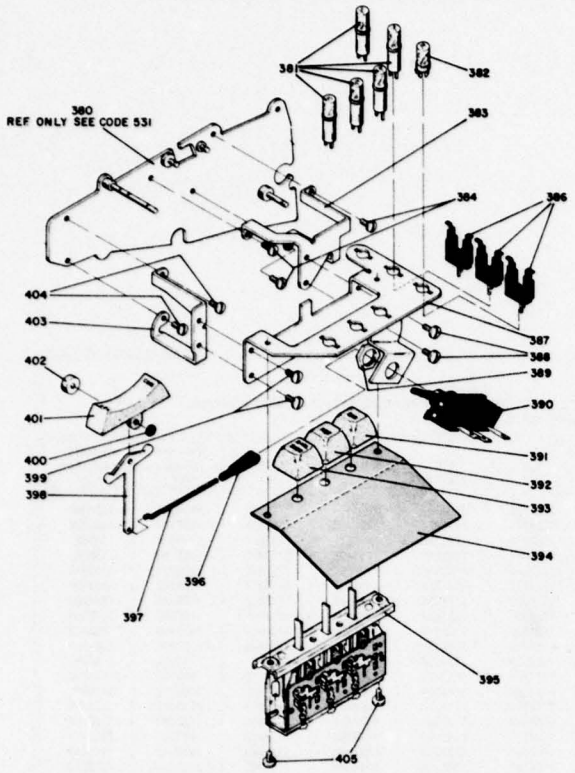
KEYBOARD SELECTION



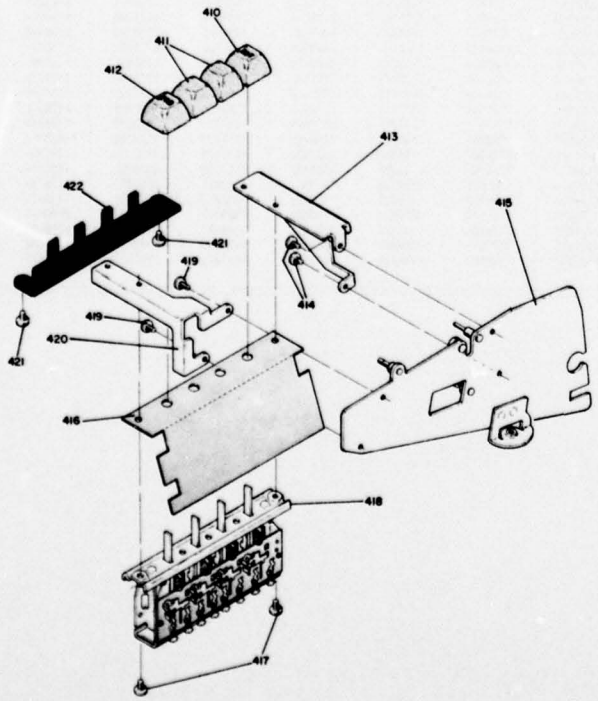
(DUAL IMPRESSION) KEYBOARD SELECTION



(835 CONTROL BUTTONS & LIGHTS) KEYBOARD SELECTION



(835 CONTROL BUTTONS & LIGHTS) KEYBOARD SELECTION



REF	P/N	SOURCE	DESCRIPTION
380	REFERENCE ONLY SEE CODE 531		
381	1176839		LIGHT BLANK WHITE
381	1176837		LIGHT BLANK YELLOW
381	1176838		LIGHT BLANK RED
381	1176834		LIGHT LETTER S
381	1176835		LIGHT LETTER T
381	1176836		LIGHT LETTER R
382	1176928		LIGHT DUMMY
383	1176832		SUPPORT RH REAR
384	1117759		SCREW SUP MTG
386	1176925		RECEPTACLE LIGHT
387	1176830		BRACKET SW RH
388	438566		SCREW SW BRKT MTG
389	179743		NUT SWITCH
390	1176939		SWITCH COM-LOCAL
391	1176814		BUTTON BID
392	1176815		BUTTON RST
393	1176816		BUTTON DIAL DISC
394	1176926		INSULATOR 3 POS SW
395	1176841		SWITCH 3 POS
396	1070020		CLEVIS
397	1133520		LINK COM-LOCAL
398	1123520		KEYLEVER COM-LOCAL
399	438566		SCREW SW BRKT MTG
400	1073418		RETAINER
401	1176824		KEYBUTTON COM-LCL
402	1176864		SPACER KEYBUTTON
403	1176831		SUPPORT RH FRONT
404	1117759		SCREW SUP MTG
405	438566		SCREW SW MTG
410	1176823		KEYBUTTON EOT
411	1176813		KEYBUTTON BLANK
412	1176821		KEYBUTTON EOB
413	1176829		SUPPORT LH REAR
414	1117759		SCREW SUP MTG
415	REFERENCE ONLY SEE CODE 531		
416	1176927		INSULATOR 4 POS SW
417	438566		SCREW SW MTG
418	1119359		SWITCH 4 POS
419	1117759		SCREW SUP MTG
420	1176828		SUPPORT LH FRONT
421	438566		SCREW DEAD KY BRKT
422	1144916		BRACKET DEAD KEY

REF	P/N	SOURCE	DESCRIPTION

CODE 903
(6400 PRIMARY PRINTER ONLY)

CODE-503

JANUARY 7, 1966

PAGE 6

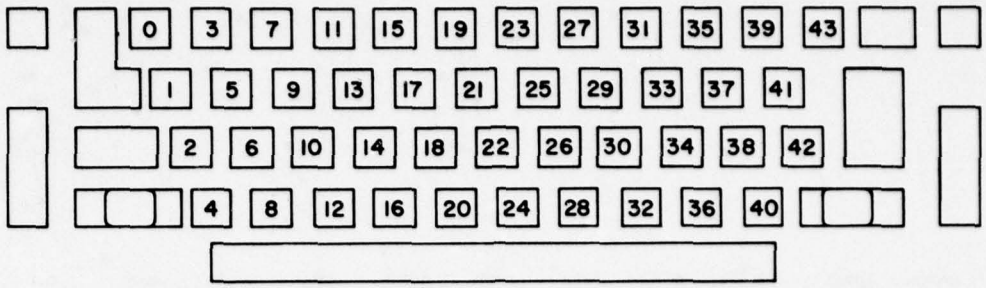
KEYBUTTONS

REF 280, ALPHA-NUMERIC KEYBUTTONS

NOTE: DETERMINE KEYBOARD POSITION FOR WHICH KEYBUTTON IS REQUIRED (SEE KEYBOARD DRAWING, THIS PAGE). LOCATE KEYBUTTON PART NUMBER BY MODEL AND TYPE HEAD CODE. THE TYPE HEAD CODE IS LOCATED ON TOP OF THE HEAD, UNDER THE CLIP SPRING

MODEL		Katakana	835-935	835-935	835-935	835-935	835-935	935	935	870	American Airlines	Delta	Panamac Cargo	Panamac Reservation
HEAD	CODE	856	963	947-948	938-939	942-943	940-941	010-015	019	924-929	910	905	905	905
KEYBOARD POSITIONS	0	1158330	1158433	1124734	1158433	1178336	1178336	1133422	1133422	1133262	1133404	1133404	1158201	1158200
	1	1158342	1124956	1124956	1124956	1124956	1124956	1124956	1124956	1133274	1124956	1124956	1133274	1133274
	2	1158353	1127611	1127611	1127611	1127611	1127611	1127611	1127611	1133285	1127611	1127611	1133981	1133981
	3	1158331	1133905	1124897	1178321	1178322	1178321	1124897	1124897	1133263	1133405	1133405	1133968	1133968
	4	1158364	1127661	1127661	1127661	1127661	1127661	1127661	1127661	1133296	1127661	1127661	1133296	1133987
	5	1158343	1124957	1124957	1124957	1124957	1124957	1124957	1124957	1133328	1124957	1124957	1133328	1133328
	6	1158354	1127612	1127612	1127612	1127612	1127612	1127612	1127612	1133286	1127612	1127612	1133286	1133286
	7	1158332	1158435	1124898	1158435	1158435	1158435	1124898	1124898	1133264	1133406	1158209	1158202	1133969
	8	1158365	1127662	1127662	1127662	1127662	1127662	1127662	1127662	1133342	1127662	1127662	1133988	1133988
	9	1158344	1124958	1124958	1124958	1124958	1124958	1124958	1124958	1133329	1124958	1124958	1133329	1133329
	10	1158355	1127613	1127613	1127613	1127613	1127613	1127613	1127613	1133335	1127413	1127613	1133982	1133982
	11	1158333	1133265	1124899	1133265	1178323	1178323	1124899	1178323	1133425	1133407	1158210	1133970	1133970
	12	1158366	1127663	1127663	1127663	1127663	1127663	1127663	1127663	1133298	1127663	1127663	1133298	1133989
	13	1158345	1124959	1124959	1124959	1124959	1124959	1124959	1124959	1133277	1124959	1124959	1133979	1133979
	14	1158356	1127614	1127614	1127614	1127614	1127614	1127614	1127614	1133336	1127614	1127614	1133983	1133983
	15	1158334	1124900	1124900	1124900	1170324	1124900	1124900	1124900	1133426	1133408	1133408	1133971	1133971
	16	1158367	1127664	1127664	1127664	1127664	1127664	1127664	1127664	1133343	1127664	1127664	1133343	1133343
	17	1158346	1124960	1124960	1124960	1124960	1124960	1124960	1124960	1133278	1124960	1124960	1133278	1133278
	18	1158357	1127615	1127615	1127615	1127615	1127615	1127615	1127615	1133337	1127615	1127615	1133337	1133337
	19	1158335	1158436	1124901	1158436	1178325	1178325	1124901	1124901	1133427	1133409	1133409	1158203	1133972
	20	1158368	1127665	1127665	1127665	1127665	1127665	1127665	1127665	1133300	1127665	1127665	1133300	1133300
	21	1153347	1124961	1124961	1124961	1124961	1124961	1124961	1124961	1133279	1124961	1124961	1133279	1133279
	22	1158358	1127616	1127616	1127616	1127616	1127616	1127616	1127616	1133290	1127616	1127616	1133984	1133984
	23	1158336	1133268	1124902	1158437	1158437	1158437	1124902	1124902	1133428	1133410	1133410	1158204	1133973
	24	1158369	1127666	1127666	1127666	1127666	1127666	1127666	1127666	1133344	1127666	1127666	1133344	1133344
	25	1158348	1124962	1124962	1124962	1124962	1124962	1124962	1124962	1133437	1124962	1124962	1133437	1133437
	26	1158359	1127617	1127617	1127617	1127617	1127617	1127617	1127617	1133291	1127617	1127617	1133291	1133291
	27	1158337	1124903	1124903	1124903	1124903	1124903	1124903	1124903	1133269	1133411	1158211	1158205	1133974
	28	1158370	1127667	1127667	1127667	1127667	1127667	1127667	1127667	1133448	1127667	1127667	1133448	1133448
	29	1158349	1124963	1124963	1124963	1124963	1124963	1124963	1124963	1133281	1124963	1124963	1133281	1133281
	30	1158360	1127618	1127618	1127618	1127618	1127618	1127618	1127618	1133292	1127618	1127618	1133985	1133985
	31	1158338	1124904	1124904	1124904	1133008	1133008	1124904	1124904	1133270	1133412	1133412	1158206	1133975
	32	1158371	1127668	1127668	1127668	1127668	1127668	1127668	1127668	1133915	1133419	1158213	1133990	1133990
	33	1158350	1124964	1124964	1124964	1124964	1124964	1124964	1124964	1133439	1124964	1124964	1133439	1133439
	34	1158361	1127619	1127619	1127619	1127619	1127619	1127619	1127619	1133293	1127619	1127619	1133293	1133293
	35	1158339	1124905	1124905	1124905	1133009	1133009	1124905	1158065	1158117	1133413	1133413	1158208	1133976
	36	1158372	1158759	1127669	1127669	1127669	1127669	1127669	1127669	1158328	1133420	1133420	1133304	1133304
	37	1158351	1124965	1124965	1124965	1124965	1124965	1124965	1124965	1133333	1124965	1124965	1133980	1133980
	38	1158362	1158439	1127620	1158439	1158439	1158439	1127620	1127620	1158326	1133417	1158212	1133295	1133986
	39	1178230	1124906	1124906	1124906	1178326	1178326	1124906	1124906	1158323	1133414	1133414	1158207	1133414
	40	1178231	1127670	1127670	1127670	1127670	1127670	1127670	1127670	1158329	1133421	1133421	1133991	1133991
	41	1158352	1158756	1124966	1158756	1178329	1178328	1124966	1124966	1158325	1133416	1133031	1133031	1133031
	42	1158363	1158757	1127671	1158440	1178331	1178330	1127671	1127671	1158327	1133497	1133033	1133033	1133033
	43	1158341	1133911	1124907	1133911	1178327	1158584	1124907	1124907	1158324	1133415	1133415	1133977	1133977

KEYBUTTONS



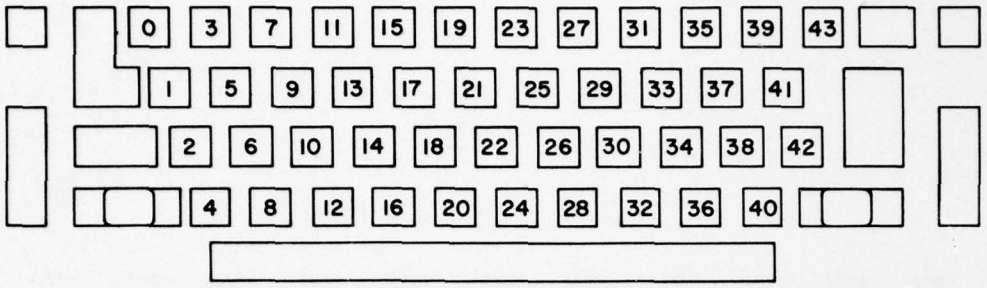
NOTE: NUMBERS INSIDE KEYBUTTON OUTLINE ARE KEYBOARD POSITIONS

REF 280 , ALPHA-NUMERIC KEYBUTTONS

NOTE: DETERMINE KEYBOARD POSITION FOR WHICH KEYBUTTON IS REQUIRED (SEE KEYBOARD DRAWING, THIS PAGE). LOCATE KEYBUTTON PART NUMBER BY MODEL AND TYPE HEAD CODE. THE TYPE HEAD CODE IS LOCATED ON TOP OF THE HEAD, UNDER THE CLIP SPRING

	MODEL	ET	ET	1014	1014	1415	1415	SABRE	SABRE	STRETCH	STRETCH	1620	ET 767
	HEAD CODE	CORR 050	BCD 908	904	916 FAA	913/914	903	910 AA	905	902 AEC	901 ECS	907	912
KEYBOARD POSITIONS	0	1124896	1133262	1133019	1133019	1133262	1133262	1133404	1133404	1133000	1133040	1133483	1124734
	1	1124956	1133434	1124956	1124956	1133274	1133274	1124956	1124956	1124956	1124956	1133274	1124956
	2	1127611	1133285	1127611	1127611	1133285	1133285	1127611	1127611	1127611	1133055	1133285	1127611
	3	1124897	1133263	1133020	1133020	1133263	1133263	1133405	1133405	1133001	1133041	1133995	1133905
	4	1127661	1133446	1127661	1127661	1133838	1133296	1127661	1127661	1127661	1127661	1133296	1127661
	5	1124957	1133328	1124957	1124957	1133833	1133275	1124957	1124957	1124957	1124957	1133328	1124957
	6	1127612	1133286	1127612	1127612	1133286	1133286	1127612	1127612	1127612	1127612	1133286	1127612
	7	1124898	1133264	1133021	1133021	1133264	1133264	1133406	1133406	1133002	1133042	1133801	1133906
	8	1127662	1133447	1127662	1127662	1133839	1133297	1127662	1127662	1127662	1127662	1133342	1127662
	9	1124958	1133329	1124958	1124958	1133834	1133276	1124958	1124958	1124958	1133052	1133329	1124958
	10	1127613	1133335	1127613	1127613	1133836	1133287	1127613	1127613	1127613	1133056	1133335	1127613
	11	1124899	1133425	1133022	1133022	1133265	1133265	1133407	1133499	1133003	1133043	1133472	1133069
	12	1127663	1133298	1127663	1127663	1133298	1133298	1127663	1127663	1127663	1133063	1133298	1127663
	13	1124959	1133435	1124959	1124959	1133277	1133277	1124959	1124959	1124959	1124959	1133277	1124959
	14	1127614	1133336	1127614	1127614	1133288	1133288	1127614	1127614	1127614	1133057	1133336	1127614
	15	1124900	1133426	1133023	1133023	1133830	1133266	1133408	1133408	1133004	1133044	1133322	1133907
	16	1127664	1133343	1127664	1127664	1133840	1133299	1127664	1127664	1127664	1127664	1133343	1127664
	17	1124960	1133278	1124960	1124960	1133278	1133278	1124960	1124960	1124960	1124960	1133278	1124960
	18	1127615	1133828	1127615	1127615	1133289	1133289	1127615	1127615	1127615	1133058	1133337	1127615
	19	1124901	1133427	1133024	1133024	1133267	1133267	1133409	1133409	1133005	1133045	1133323	1133908
	20	1127665	1133300	1127665	1127665	1133300	1133300	1127665	1127665	1127665	1133064	1133300	1127665
	21	1124961	1133436	1124961	1124961	1133279	1133279	1124961	1124961	1124961	1124961	1133279	1124961
	22	1127616	1133443	1127616	1127616	1133290	1133290	1127616	1127616	1127616	1133059	1133290	1127616
	23	1124902	1133428	1133025	1133025	1133268	1133268	1133410	1133410	1133006	1133046	1133468	1133909
	24	1127666	1133344	1127666	1127666	1133301	1133301	1127666	1127666	1127666	1127666	1133344	1127666
	25	1124962	1133437	1124962	1124962	1133835	1133280	1124962	1124962	1124962	1124962	1133476	1124962
	26	1127617	1133291	1127617	1127617	1133291	1133291	1127617	1127617	1127617	1133060	1133478	1127617
	27	1124903	1133429	1133026	1133026	1133269	1133269	1133411	1133411	1133007	1133047	1133325	1133910
	28	1127667	1133448	1127667	1127667	1133841	1133302	1127667	1127667	1127667	1127667	1133480	1127667
	29	1124963	1133438	1124963	1124963	1133281	1133281	1124963	1124963	1124963	1133053	1133474	1124963
	30	1127618	1133292	1127618	1127618	1133292	1133292	1127618	1127618	1127618	1127618	1133477	1127618
	31	1124904	1133430	1133027	1133027	1133270	1133270	1133412	1133412	1133008	1133048	1133470	1124904
	32	1127668	1133494	1133355	1158068	1133303	1133303	1133419	1133034	1133015	1133065	1133482	1133915
	33	1124964	1133439	1124964	1124964	1133282	1133282	1124964	1124964	1133018	1133018	1133475	1124964
	34	1127619	1133293	1127619	1127619	1133293	1133293	1127619	1127619	1127619	1127619	1133479	1127619
	35	1124905	1133431	1133351	1133351	1133271	1133271	1133413	1133413	1133009	1133049	1133471	1124905
	36	1127669	1133449	1133035	1133035	1133304	1133304	1133420	1133420	1133016	1133016	1133481	1133916
	37	1124965	1133827	1124965	1124965	1133283	1133283	1124965	1124965	1124965	1124965	1133333	1124965
	38	1127620	1133444	133354	1158066	1133837	1133294	1133417	1133032	1133013	1133061	1133341	1133913
	39	1124906	1133432	1133030	1133030	1133831	1133272	1133414	1133414	1133010	1133050	1133469	1124906
	40	1127670	1133305	1133036	1133036	1133305	1133305	1133421	1133421	1133017	1133017	1133305	1127670
	41	1124966	1133860	1133353	1133353	1133284	1133284	1133416	1133031	1133012	1133054	1133473	1133912
	42	1127671	1133445	1133032	1158067	1133295	1133295	1133497	1133033	1133014	1133062	1133295	1133914
	43	1124907	1133433	1133352	1133352	1133832	1133273	1133415	1133415	1133011	1133051	1133996	1133911

KEYBUTTONS



NOTE: NUMBERS INSIDE KEYBUTTON OUTLINE ARE KEYBOARD POSITIONS

REF 280 , ALPHA-NUMERIC KEYBUTTONS

NOTE: DETERMINE KEYBOARD POSITION FOR WHICH KEYBUTTON IS REQUIRED (SEE KEYBOARD DRAWING, THIS PAGE). LOCATE KEYBUTTON PART NUMBER BY MODEL AND TYPE HEAD CODE. THE TYPE HEAD CODE IS LOCATED ON TOP OF THE HEAD, UNDER THE CLIP SPRING

	MODEL	ET	ET	1014	1014	1415	1415	SABRE	SABRE	STRETCH	STRETCH	1620	ET 767
	HEAD CODE	CORR 050	BCD 908	904	916 FAA	913/914	903	910 AA	905	902 AEC	901 ECS	907	912
KEYBOARD POSITIONS	0	1124896	1133262	1133019	1133019	1133262	1133262	1133404	1133404	1133000	1133040	1133483	1124734
	1	1124956	1133434	1124956	1124956	1133274	1133274	1124956	1124956	1124956	1124956	1133274	1124956
	2	1127611	1133285	1127611	1127611	1133285	1133285	1127611	1127611	1127611	1133055	1133285	1127611
	3	1124897	1133263	1133020	1133020	1133263	1133263	1133405	1133405	1133001	1133041	1133995	1133905
	4	1127661	1133446	1127661	1127661	1133838	1133296	1127661	1127661	1127661	1127661	1133296	1127661
	5	1124957	1133328	1124957	1124957	1133833	1133275	1124957	1124957	1124957	1124957	1133328	1124957
	6	1127612	1133286	1127612	1127612	1133286	1133286	1127612	1127612	1127612	1127612	1133286	1127612
	7	1124898	1133264	1133021	1133021	1133264	1133264	1133406	1133406	1133002	1133042	1133801	1133906
	8	1127662	1133447	1127662	1127662	1133839	1133297	1127662	1127662	1127662	1127662	1133342	1127662
	9	1124958	1133329	1124958	1124958	1133834	1133276	1124958	1124958	1124958	1133052	1133329	1124958
	10	1127613	1133335	1127613	1127613	1133836	1133287	1127613	1127613	1127613	1133056	1133335	1127613
	11	1124899	1133425	1133022	1133022	1133265	1133265	1133407	1133499	1133003	1133043	1133472	1133069
	12	1127663	1133298	1127663	1127663	1133298	1133298	1127663	1127663	1127663	1133063	1133298	1127663
	13	1124959	1133435	1124959	1124959	1133277	1133277	1124959	1124959	1124959	1124959	1133277	1124959
	14	1127614	1133336	1127614	1127614	1133288	1133288	1127614	1127614	1127614	1133057	1133336	1127614
	15	1124900	1133426	1133023	1133023	1133830	1133266	1133408	1133408	1133004	1133044	1133322	1133907
	16	1127664	1133343	1127664	1127664	1133840	1133299	1127664	1127664	1127664	1127664	1133343	1127664
	17	1124960	1133278	1124960	1124960	1133278	1133278	1124960	1124960	1124960	1124960	1133278	1124960
	18	1127615	1133828	1127615	1127615	1133289	1133289	1127615	1127615	1127615	1133058	1133337	1127615
	19	1124901	1133427	1133024	1133024	1133267	1133267	1133409	1133409	1133005	1133045	1133323	1133908
	20	1127665	1133300	1127665	1127665	1133300	1133300	1127665	1127665	1127665	1133064	1133300	1127665
	21	1124961	1133436	1124961	1124961	1133279	1133279	1124961	1124961	1124961	1124961	1133279	1124961
	22	1127616	1133443	1127616	1127616	1133290	1133290	1127616	1127616	1127616	1133059	1133290	1127616
	23	1124902	1133428	1133025	1133025	1133268	1133268	1133410	1133410	1133006	1133046	1133468	1133909
	24	1127666	1133344	1127666	1127666	1133301	1133301	1127666	1127666	1127666	1127666	1133344	1127666
	25	1124962	1133437	1124962	1124962	1133835	1133280	1124962	1124962	1124962	1124962	1133476	1124962
	26	1127617	1133291	1127617	1127617	1133291	1133291	1127617	1127617	1127617	1133060	1133478	1127617
	27	1124903	1133429	1133026	1133026	1133269	1133269	1133411	1133411	1133007	1133047	1133325	1133910
	28	1127667	1133448	1127667	1127667	1133841	1133302	1127667	1127667	1127667	1127667	1133480	1127667
	29	1124963	1133438	1124963	1124963	1133281	1133281	1124963	1124963	1124963	1133053	1133474	1124963
	30	1127618	1133292	1127618	1127618	1133292	1133292	1127618	1127618	1127618	1127618	1133477	1127618
	31	1124904	1133430	1133027	1133027	1133270	1133270	1133412	1133412	1133008	1133048	1133470	1124904
	32	1127668	1133494	1133355	1158068	1133303	1133303	1133419	1133034	1133015	1133065	1133482	1133915
	33	1124964	1133439	1124964	1124964	1133282	1133282	1124964	1124964	1133018	1133018	1133475	1124964
	34	1127619	1133293	1127619	1127619	1133293	1133293	1127619	1127619	1127619	1127619	1133479	1127619
	35	1124905	1133431	1133351	1133351	1133271	1133271	1133413	1133413	1133009	1133049	1133471	1124905
	36	1127669	1133449	1133035	1133035	1133304	1133304	1133420	1133420	1133016	1133016	1133481	1133916
	37	1124965	1133827	1124965	1124965	1133283	1133283	1124965	1124965	1124965	1124965	1133333	1124965
	38	1127620	1133444	133354	1158066	1133837	1133294	1133417	1133032	1133013	1133061	1133341	1133913
	39	1124906	1133432	1133030	1133030	1133831	1133272	1133414	1133414	1133010	1133050	1133469	1124906
	40	1127670	1133305	1133036	1133036	1133305	1133305	1133421	1133421	1133017	1133017	1133305	1127670
	41	1124966	1133860	1133353	1133353	1133284	1133284	1133416	1133031	1133012	1133054	1133473	1133912
	42	1127671	1133445	1133032	1158067	1133295	1133295	1133497	1133033	1133014	1133062	1133295	1133914
	43	1124907	1133433	1133352	1133352	1133832	1133273	1133415	1133415	1133011	1133051	1133996	1133911

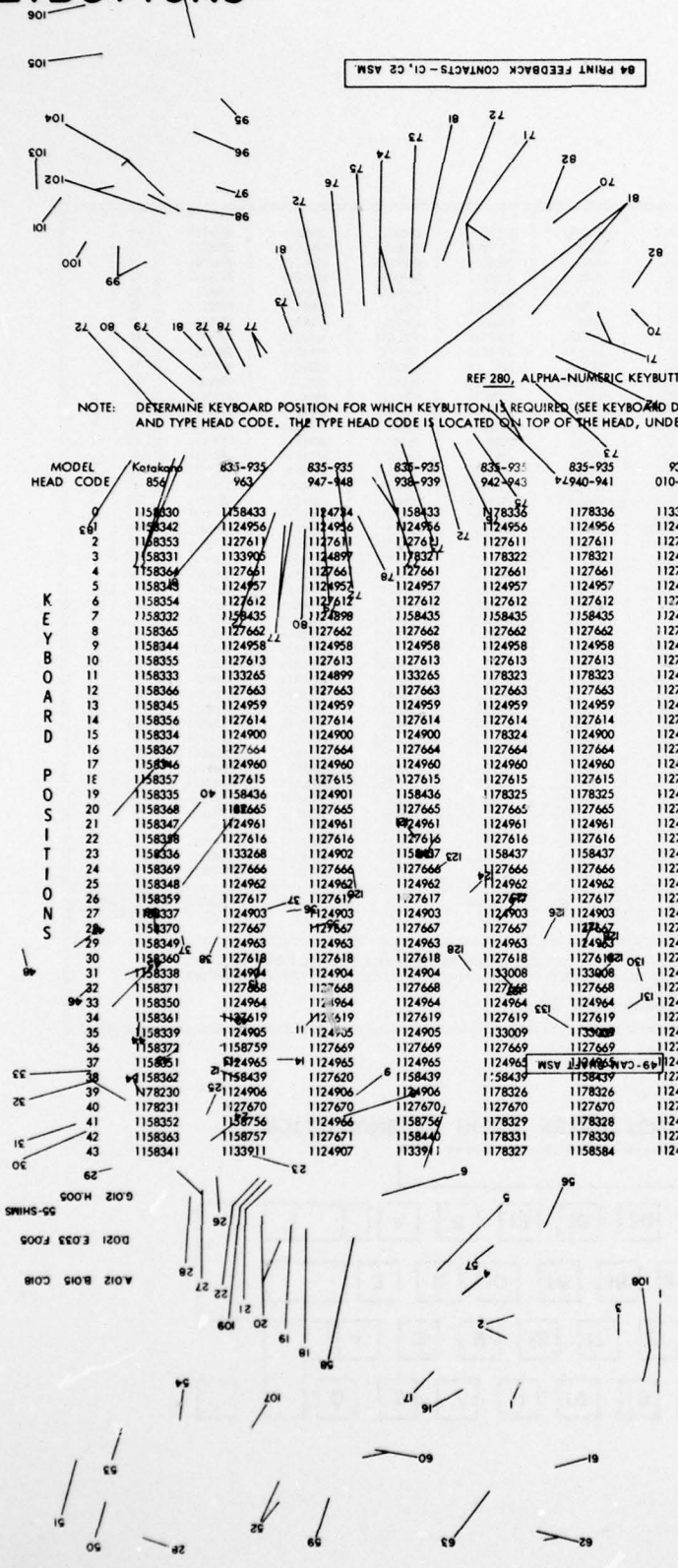
PAGE 6

KEYBUTTONS

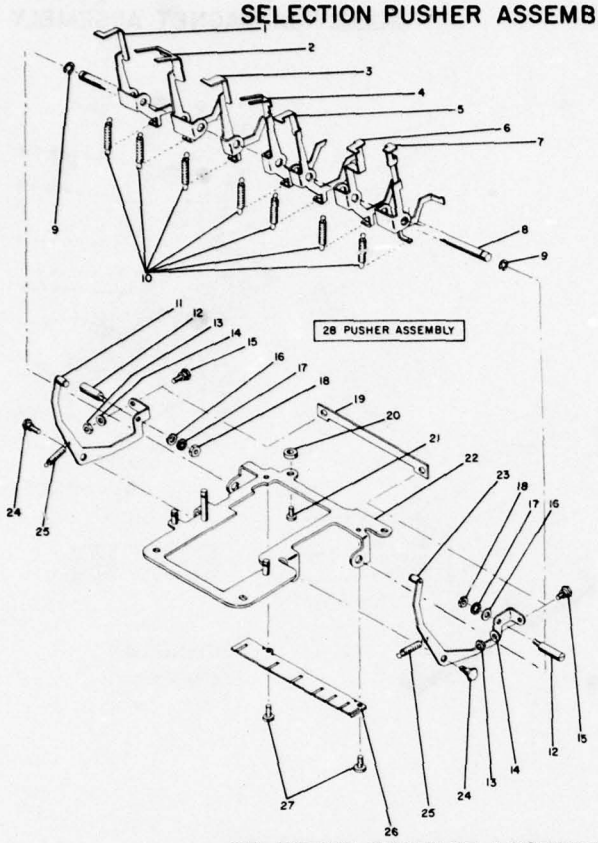
REF 280, ALPHA-NUMERIC KEYBUTTONS

NOTE: DETERMINE KEYBOARD POSITION FOR WHICH KEYBUTTON IS REQUIRED (SEE KEYBOARD DRAWING, THIS PAGE). LOCATE KEYBUTTON PART NUMBER BY MODEL AND TYPE HEAD CODE. THE TYPE HEAD CODE IS LOCATED ON TOP OF THE HEAD, UNDER THE CLIP SPRING

KEYBOARD POSITIONS	MODEL / HEAD CODE	Katakana 856	835-935 963	835-935 947-948	835-935 936-939	835-935 942-943	835-935 940-941	935 010-015	935 019	870 924-929	American Airlines 910	Delta 905	Panamac Cargo 905	Panamac Reservation 905
	0	1158330	1158433	1124734	1158433	1178336	1178336	1133422	1133422	1133262	1133404	1133404	1158201	1158200
	1	1158342	1124956	1124956	1124956	1124956	1124956	1124956	1124956	1133274	1124956	1124956	1133274	1133274
	2	1158353	1127611	1127611	1127611	1127611	1127611	1127611	1127611	1133285	1127611	1127611	1133981	1133981
	3	1158331	1133905	1124897	1178321	1178322	1178321	1124897	1124897	1133263	1133405	1133405	1133968	1133968
	4	1158369	1127661	1127661	1127661	1127661	1127661	1127661	1127661	1133296	1127661	1127661	1133296	1133987
	5	1158348	1124957	1124952	1124957	1124957	1124957	1124957	1124957	1133328	1124957	1124957	1133328	1133328
K	6	1158354	1127612	1127612	1127612	1127612	1127612	1127612	1127612	1133286	1127612	1127612	1133286	1133286
E	7	1158332	1158435	1124898	1158435	1158435	1158435	1124898	1124898	1133264	1133406	1158209	1158202	1133969
Y	8	1158365	1127662	1127662	1127662	1127662	1127662	1127662	1127662	1133342	1127662	1127662	1133988	1133988
B	9	1158344	1124958	1124958	1124958	1124958	1124958	1124958	1124958	1133329	1124958	1124958	1133329	1133329
O	10	1158355	1127613	1127613	1127613	1127613	1127613	1127613	1127613	1133335	1127413	1127613	1133982	1133982
A	11	1158333	1133265	1124899	1133265	1178323	1178323	1124899	1178323	1133425	1133407	1158210	1133970	1133970
R	12	1158366	1127663	1127663	1127663	1127663	1127663	1127663	1127663	1133298	1127663	1127663	1133298	1133989
D	13	1158345	1124959	1124959	1124959	1124959	1124959	1124959	1124959	1133277	1124959	1124959	1133979	1133979
	14	1158356	1127614	1127614	1127614	1127614	1127614	1127614	1127614	1133336	1127614	1127614	1133983	1133983
P	15	1158334	1124900	1124900	1124900	1178324	1124900	1124900	1124900	1133426	1133408	1133408	1133971	1133971
O	16	1158367	1127664	1127664	1127664	1127664	1127664	1127664	1127664	1133343	1127664	1127664	1133343	1133343
S	17	1158346	1124960	1124960	1124960	1124960	1124960	1124960	1124960	1133278	1124960	1124960	1133278	1133278
I	18	1158357	1127615	1127615	1127615	1127615	1127615	1127615	1127615	1133337	1127615	1127615	1133337	1133337
T	19	1158335	1158436	1124901	1158436	1178325	1178325	1124901	1124901	1133427	1133409	1133409	1158203	1133972
I	20	1158368	1127665	1127665	1127665	1127665	1127665	1127665	1127665	1133300	1127665	1127665	1133300	1133300
O	21	1158347	1124961	1124961	1124961	1124961	1124961	1124961	1124961	1133279	1124961	1124961	1133279	1133279
N	22	1158338	1127616	1127616	1127616	1127616	1127616	1127616	1127616	1133290	1127616	1127616	1133984	1133984
S	23	1158336	1133268	1124902	1158437	1158437	1158437	1124902	1124902	1133428	1133410	1133410	1158204	1133973
	24	1158369	1127666	1127666	1127666	1127666	1127666	1127666	1127666	1133344	1127666	1127666	1133344	1133344
	25	1158348	1124962	1124962	1124962	1124962	1124962	1124962	1124962	1133437	1124962	1124962	1133437	1133437
	26	1158359	1127617	1127617	1127617	1127617	1127617	1127617	1127617	1133291	1127617	1127617	1133291	1133291
	27	1158337	1124903	1124903	1124903	1124903	1124903	1124903	1124903	1133269	1133411	1158211	1158205	1133974
	28	1158370	1127667	1127667	1127667	1127667	1127667	1127667	1127667	1133448	1127667	1127667	1133448	1133448
	29	1158349	1124963	1124963	1124963	1124963	1124963	1124963	1124963	1133281	1124963	1124963	1133281	1133281
	30	1158360	1127618	1127618	1127618	1127618	1127618	1127618	1127618	1133292	1127618	1127618	1133985	1133985
	31	1158338	1124904	1124904	1124904	1133008	1133008	1124904	1124904	1133270	1133412	1133412	1158206	1133975
	32	1158371	1127668	1127668	1127668	1127668	1127668	1127668	1127668	1133915	1133419	1158213	1133990	1133990
	33	1158350	1124964	1124964	1124964	1124964	1124964	1124964	1124964	1133439	1124964	1124964	1133439	1133439
	34	1158361	1127619	1127619	1127619	1127619	1127619	1127619	1127619	1133293	1127619	1127619	1133293	1133293
	35	1158339	1124905	1124905	1124905	1133009	1133009	1124905	1124905	1158065	1158117	1133413	1133413	1158208	1133976
	36	1158372	1158759	1127669	1127669	1127669	1127669	1127669	1127669	1158328	1133420	1133420	1133304	1133304
	37	1158351	1124965	1124965	1124965	1124965	1124965	1124965	1124965	1133333	1124965	1124965	1133980	1133980
	38	1158362	1158439	1127620	1158439	1158439	1158439	1127620	1127620	1158326	1133417	1158212	1133295	1133986
	39	1178230	1124906	1124906	1124906	1178326	1178326	1124906	1124906	1158323	1133414	1133414	1158207	1133414
	40	1178231	1127670	1127670	1127670	1127670	1127670	1127670	1127670	1158329	1133421	1133421	1133991	1133991
	41	1158352	1158756	1124966	1158756	1178329	1178328	1124966	1124966	1158325	1133416	1133031	1133031	1133031
	42	1158363	1158757	1127671	1158440	1178331	1178330	1127671	1127671	1158327	1133497	1133033	1133033	1133033
	43	1158341	1133911	1124907	1133911	1178327	1158584	1124907	1124907	1158324	1133415	1133415	1133977	1133977



SELECTION PUSHER ASSEMBLY



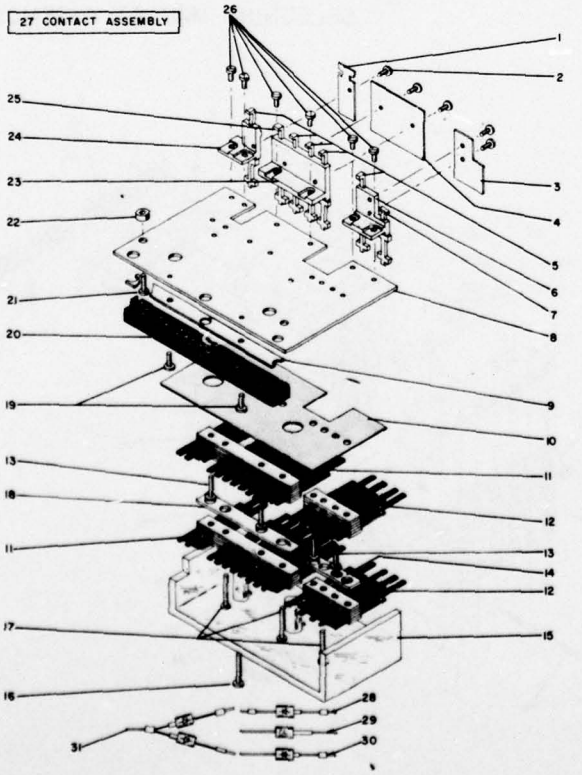
REF	P/N	SOURCE	DESCRIPTION
1	1128605		PUSHER LATCH T2
2	1128606		PUSHER LATCH CK
3	1128607		PUSHER LATCH T1
4	1128608		PUSHER LATCH R2A
5	1128609		PUSHER LATCH R1
6	1128610		PUSHER LATCH R2
7	1128611		PUSHER LATCH R5
8	1128624		ROD PUSHER LATCH
9	1092125		RETAINER
10	1090162		SPRING PUSHER
11	1128616		CAM FOLL ASM LH
12	1128626		ECCENTRIC KO
13	47987		NUT
14	358509		WASHER
15	1128627		SCREW CAM ADJUST
16	1135052		SPACER
17	150209		WASHER LOCK
18	37913		NUT
19	1128625		BAIL PUSHER
20	1128598		SPACER MAG ASM
21	1164577		SCREW
22	1128613		PLATE ASM PUSHER
23	1128622		CAM FOLL ASM RH
24	1159155		SCREW CAM FOLLOWER
	MACHINES BELOW 4608000 ORDER REF 11 AND/OR 23 ALSO		
25	10514		SPRING CAM FOLL
26	1128623		GUIDE PUSHER
27	38259		SCREW GUIDE PUSHER
28	1128604		PUSHER ASM B/M
28	1166054		PUSHER ASM
	ABOVE SN 4616461		

REF	P/N	SOURCE	DESCRIPTION

CODE 905
(6400 PRIMARY PRINTER ONLY)

CODE-505

SELECTION CONTACT ASSEMBLY



REF	P/N	SOURCE	DESCRIPTION
1	1128824		PLATE, ACTUATOR LH
2	1856		SCREW ACT RET PLAT
2	186399		SCREW 767
3	1128826		PLATE, ACTUATOR RH
4	1128825		PLATE, ACT, CENTER
5	1128817		ACTUATOR, CONTACT
	ON MACHINES BELOW 4081584, REPLACE CORRESPONDING ACTUATOR PLATE		
6	1128822		GUIDE, CONT ACT RH
7	1128819		ACTUATOR, 5 UNIT
8	1128829		PLATE CONT ASM MTG
8	1144820		PLATE 767
9	302131		INSULATOR, TERM BL
10	1128827		INSULATOR, CONTACT
11	1128795		CONT STRAP UPPR LH
11	1128798		CONT STRAP CTR LH
11	1128803		CONT STRAP LWR LH
12	1128806		CONT STRAP UPPR RH
12	1128809		CONT STRAP CTR RH
12	1128812		CONT STRAP LWR RH
13	438550		SCREW CONTACT MTG
14	1128816		SPACER, CONTACT RH
15	1128823		COVER, CONT ASM
	ON MACHINES BELOW 4086527, REF 16 MUST ALSO BE REPLACED.		
16	45183		SCREW, CONT COVER
16	333182		SCREW 767
17	438554		SCREW, CONT MTG
18	1128815		SPACER, CONTACT LH
19	236550		SCREW TERM BLK MTG
20	302090		BLOCK, TERMINAL
21	38353		SCREW, CONT ASM MT
22	1128828		SPACER, CONT PLATE
23	1128821		GUIDE, CONT ACT CT
24	1128820		GUIDE, CONT ACT LH
25	1128818		ACTUATOR, CK CONT
26	1164582		SCREW ACT GUIDE
	CONTACT ASSEMBLY-COMPLETE		
27	1135283		11 AND 15 INCH BCD
27	1135286		11 AND 15 IN CORR
27	1135217		1014
27	1128849		1415 7040 7044
27	1128794		SABRE
27	1128844		STRETCH
27	1135788		1620
27	1144819		767
27	1159357		775
27	1176932		835
28	1135573		DIODE
29	369125		DIODE
30	1135513		DIODE
31	1135643		DIODE

REF	P/N	SOURCE	DESCRIPTION

CODE 906
(6400 PRIMARY PRINTER ONLY)

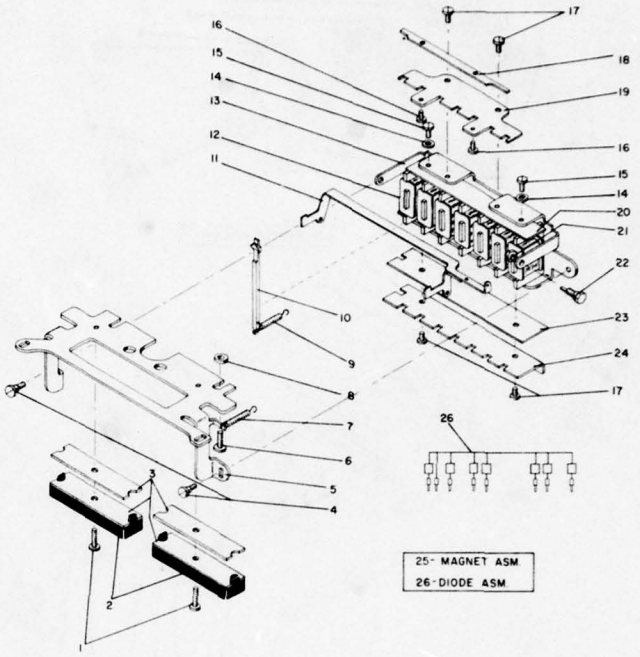
CODE-506

PAGE 10

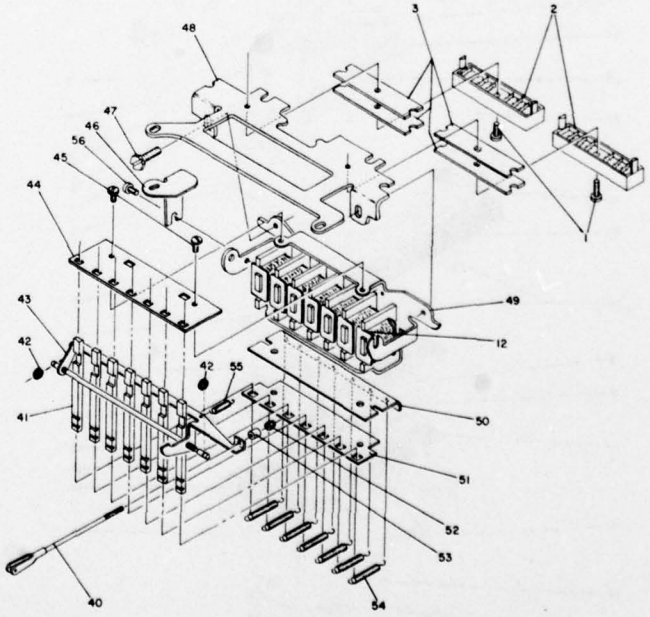
REF	P/N	SOURCE	DESCRIPTION
1	438549		SCREW TERM BLK MTG
2	302090		BLOCK ASM TERM
3	302131		INSULATOR TERM BL
4	1128591		SCREW MAG ASM MTG
5	1128582		BRACKET MAG ASM
6	1164577		SCREW OPER MAG MTG
7	1107794		SPRING KO ARM RET
8	1128598		SPACER PRT SEL MAG
9	1100937		SPRING ARMATURE
10	1128584		ARMATURE
11	1135135		BAIL KO
12	1135134		COIL ASM 48V
12	1266894		COIL ASM 24V
13	1128583		CORE ASM MAG MTG
14	1124247		WASHER ARM STOP
15	1856		SCREW ARM STOP
16	358174		SCREW ARM UP STOP
17	1164582		SCREW MTG
18	1128588		BACKSTOP ARMATURE
19	1128589		GUIDE ARM TOP
20	1128587		STOP ARMATURE
21	221		NUT ECC PIVOT SCR
22	1128592		SCREW KO ARM PIVOT
23	1128585		PIVOT ARMATURE
24	1128586		GUIDE ARMATURE
25	1135136		MAGNET ASM 48V
25	*1159545		MAGNET ASM 48V
25	1266897		MAGNET ASM 24V
25	*1159546		MAGNET ASM 24V
	*USED ABOVE SN 4616461		
26	1135575		DIODE ASSEMBLY COMMON ANODE
26	1145415		DIODE ASM 765-767 COMMON CATHODE
40	1166088		LINK TRIP
41	1159972		ARMATURE SELECTION
42	219633		RETAINER
43	1159660		ARM ASM CY CLU TRP
44	1159973		STOP SEL ARMATURE
45	55729		SCREW
46	1166187		SUPPORT MOUNT
47	1066053		SCREW MAG MOUNTING
48	1159978		BRACKET MAG ASM
49	1159982		MOUNT AND CORE ASM
50	1159975		PIVOT ARMATURE
51	1159974		GUIDE ARMATURE
52	1159716		NUT ADJ
53	1128685		WASHER SHOCK ABS
54	1166203		SPRING ARMATURE
55	1134831		SPRING
56	1128352		SCREW

REF	P/N	SOURCE	DESCRIPTION

SELECTION MAGNET ASSEMBLY



SELECTION MAGNET ASSEMBLY

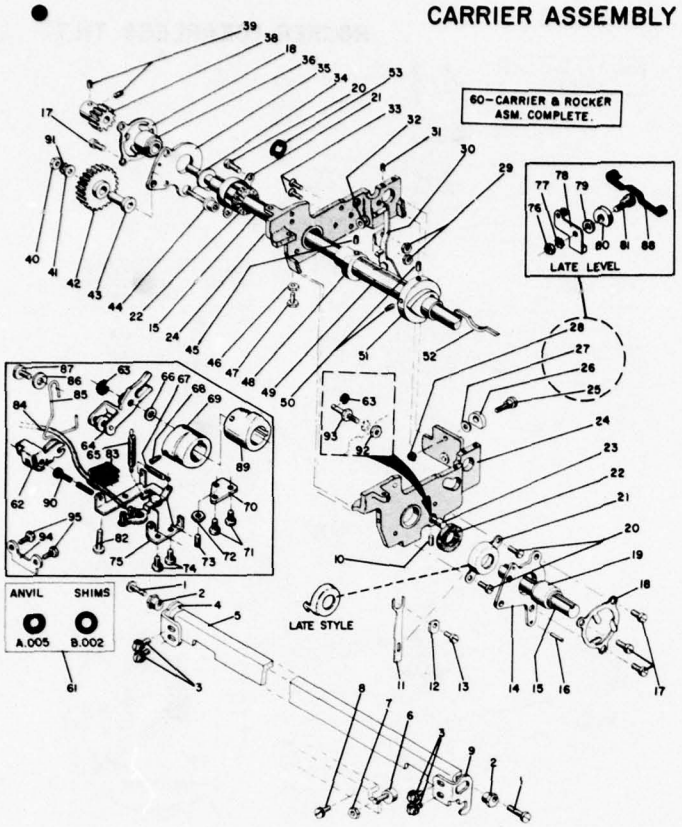


CODE 907
(6400 PRIMARY PRINTER ONLY)

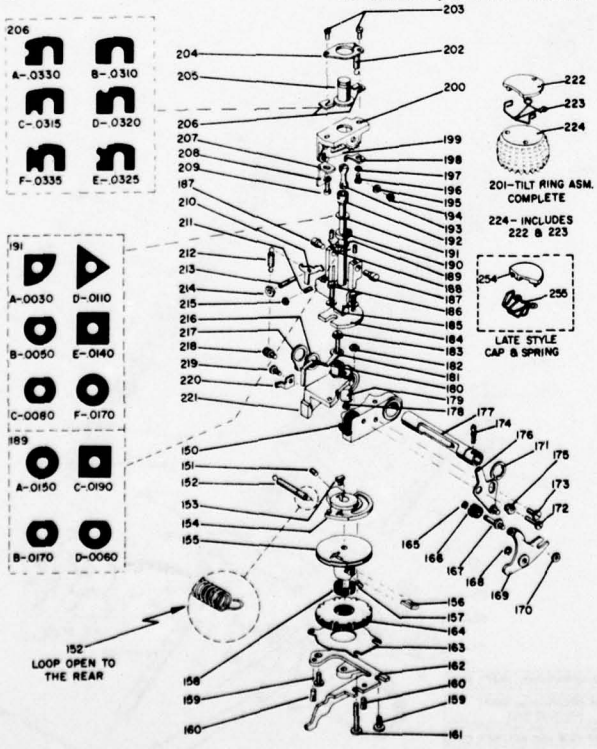
CODE-507

JANUARY 7, 1966

CARRIER ASSEMBLY



ROCKER (GEAR TILT)



REF	P/N	SOURCE	DESCRIPTION
1	1124158		SCREW, ANVIL ECC
2	1124161		ECCENTRIC, ANVIL
3	1145543		SCREW ANVIL MTG
4	1124163		BRACKET,LH ANV MTG
5	1141640		SUPPORT 15 IN
	USED WITH IMP CONTROL C&R		
5	1135494		ANVIL, 11 IN
5	1128047		ANVIL, 15 IN
5	1144798		ANVIL 767
6	1128054		ECCENTRIC, ANVIL
7	38051		NUT, ECCENTRIC MTG
8	1141097		SCREW, ANVIL MTG
9	1124162		BRACKET,RH ANVIL
10	257959		SCREW, PRINT CAM
11	1128126		BUFFER, CARRIER 15 INCH
11	1144919		BUFFER 767
12	1128184		ECCENTRIC,CARR BUF
13	38262		SCREW, BUFFER
14	1135591		PLATE,RH PRNT SH B
14 □	1124648		PLATE,RH-OLD
15*	1164736		SHAFT PRINT 11 IN
15*□	1164738		SHAFT PRINT 15 IN
	*□USED ABOVE SN 4618349 WITH REF 53		
15	1124169		SHAFT, PRINT-11 IN
15□□	1138846		SHAFT, PRINT-11 IN
15□□	1138848		SHAFT, PRINT-15 IN
15	1128048		SHAFT, PRINT-15 IN
	□□USED ABOVE SN 4604700		
15	1144782		SHAFT 767
	USED ABOVE SN 4604996-ON 767 BELOW 4604996 ORDER REF 15, 34&36 AS INDICATED FOR 4604700 & ABOVE		
16	1132212		PIN
17	38350		SCREW,PRNT SHFT BR
18	1124168		RETAINER PRNT SHFT
18	1141749		RETAINER EXCEP 767
19	1124167		BEARING,RH PRNT SH
19*□	1164740		BEARING PRINT SH
20	38261		SCREW,PRNT SHFT RE
21	1124646		RETAINER,PRNT SH
21	1141508		RETAINER-LATE
22	1124647		WIPER, PRINT SHAFT
23	1124176		STUD PRINT CAM FOL
24	1141200		CARRIER, ASM
	WHEN REPLACING CARRIER ASM ON 11 IN BELOW 4036419 & 15 IN BELOW 4354172,ORDER NYLON THRUST WASHER PN 1141189 AND REF 216		
24	1128740		CARRIER RED RIB
24	1145528		CARRIER ASM 767
25	*1141159		SCREW, CARR ROLL E
26	*1141158		SHOE,CARRIER UPPER
27	*1141160		WASHER, SHOE ECC
	*ON MACHINES BELOW 4080724,11 IN & 4379694,15 IN, REPLACEMENT OF REF 25,26, OR 27 REQUIRES REPLACING ALL THREE		
28	1141209		NUT, SHOE ECC STUD
29	37913		NUT, DETENT BRKT
30	1124178		BRACKET, DETENT
30	1164153		BRACKET USED ON IMP CNTL C&R
31	257957		SCREW, ROCKER SHFT
32	1134803		ROLLER, DET CAM FO
	WHEN INSTALLING ROLLER BELOW 4014700 ORDER REF 181 ALSO		
33	472729		SCREW, DET LEV MTG
34	1090511		WASHER,PRINT SHFT
34	1141458		WASHER
	ABOVE SN 4604700		
35	1135590		PLATE,LH PRNT SH B
35 □	1127762		PLATE, OLD
35	1144781		PLATE LH 767
	BELOW SN 4613877		
36*□	1164740		BEARING PRINT SH
36	1124166		BEARING,LH PRNT SH
36	1138845		BEARING LH PRNT SH
	USED ABOVE SN 4604700		
38	1123679		GEAR, PRINT SHAFT
38*□	1164739		GEAR PRINT SHAFT
	*□USED ABOVE SN 4618349		
39	257969		SCREW,PRINT SHAFT
40	38051		NUT, IDLER GEAR SC
41	1134843		WASHER, IDLER GEAR
42	1159350		GEAR UPPER IDLER
42	1144783		GEAR 767
43	1159097		STUD UPPER IDLER G
44	1134841		SCREW, IDLER GR MT
45	257957		SCREW, DETENT CAM
46	38214		NUT,CARR STOP 15 INCH
47	1124287		SCREW,CARR STP 15 INCH
48**	1141149		CAM,RIB FD &DETENT
48	1164240		CAM RIB FD&DETENT
	USED ON IMP CONTROL C&R FOR RED RIB SEE CODE 530		
49**	1138849		SLEEVE PRINT
49	1166102		SLEEVE PRINT
	USED ABOVE 4608189 ON 767 AND 4607632-OTHERS		
49	1159508		SLEEVE PRINT R RIB
	USED PRIOR TO STICK SHIFT		
50	257971		SCREW PRINT CAM
50	257961		SCREW, PRINT CAM
	USED ON MACHINES ABOVE 4085700 11 IN & 4382850, 15 IN		
51	1124174		CAM, PRINT
52**	1141151		KEY, PRINT SLEEVE
	**ON 11 IN BELOW 4034780 & 15 IN BELOW 4352650,REPLACEMENT OF EITHER REF 48,49, OR 52 REQUIRES REPLACEMENT OF ALL THREE		
53	237245		C-CLIP PRINT SHAFT ABOVE SN 4618349
60	1159908		C&R STICK SHIFT
60	1159905		C&R STICK RED RIB
60	1144804		C&R ST SHIFT 767
60	1164254		CARRIER & ROCKER
60	1135043		CARRIER RED RIB
61	1145396		SHIM A
61	1145395		SHIM B
	□USE ON 15 IN MACHINE WITH OLD STYLE-FLAT LEAF-MARGIN RACK LOAD SPRING-BELOW SN 4604996		
62	1141626		YOKE
63	1073418		RETAINER
64	1141619		FOLLOWER
64	1145522		FOLLOWER 767
65	1141630		SPRING ROCKER RET
65	1176827		SPRING RET 835-935
66	1164290		WASHER PRT CAM FOL
	USE WITH REF 23 & REF 10		

REF	P/N	SOURCE	DESCRIPTION
67	1123827		SPRING ROLLER RET
68	1127760		SCREW PRINT CAM
69	1141627		CAM PRINT DUAL IMP
70	1141629		STOP ROCKER
71	472729		SCREW STOP
72	2114985		NUT STOP
73	257958		SCREW ROCKER STOP
74	1164580		SCREW TAB CORD ANC
75	1141624		BRACKET TAB CORD
75	1145490		BRACKET SPRING 767
76	38051		NUT
77	56722		LOCKWASHER
78	1141775		SHOE ASM LOWER
79	1164218		WASHER SHOE ECC
80	1141770		SHOE UPPER
80	1145525		SHOE UPPER 767
81	1141772		STUD SHOE ECC
82	38262		SCREW ANCHOR MTG
83	1141636		CLIP CABLE ANCHOR
84	1141763		CABLE 11 IN
84	1141765		CABLE 15 IN
85	1141637		GUIDE CABLE
86	1090657		WASHER CABLE GUIDE
87	1164582		SCREW CABLE GUIDE
88	1166164		SPRING SHOE 775
89	1176826		CAM NO PRINT 835
90	1141622		STUD ANCH BRKT
91	56722		LOCKWASHER
92	6503		NUT, FOLLOWER STUD
93	1164562		STUD,PRNT CAM FOLL
	IF FOLLOWER IS NOT COUNTERSUNK ORDER FOLLOWER-REF 64, STUD-REF 93 & NUT-REF 92 DO NOT USE WASHER-REF 66 WITH STUD-REF 93		
94	1164435		PAD BEARING
95	1124827		SCREW MTG
150	1124218		RETAINER, SPRG DRU
151	257959		SCREW, TILT PULLEY
152	1133660		SPRING,TILT PULLEY
153	1132148		KEY, TILT PULLEY
154	1124712		PULLEY, TILT
155	1124196		PULLEY, ROTATE
156	1124745		KEY, ROTATE PULLEY
157	257957		SCREW, ROTATE PULL
158	1141238		CLIP,ROTATE PULLEY
159	1164580		SCREW, STRIKER MTG
160	1132118		DOWEL, STRIKER
161	438554		SCREW, STRIKER MTG
162	1127742		STRIKER
162	1128450		STRIKER
	USED ABOVE SN 4610347		
163	1124217		PLATE, ROTATE SPRG
163	1164548		PLATE-IMP CONT C&R
164	1132244		SPRING, ROTATE ASM
165	1073418		C-CLIP,FOLLOWER
166	1132279		FOLLOWER, REST CAM
167	1127723		STUD, RESTOR CAM F
168	1073418		C-CLIP,PRNT CM F
169	1124830		FOLLOWER,PRINT CAM
170	1127722		NUT,REST CAM FOLL
171	236571		RETAINER,ROCKER SH
172	1164580		SCREW, VEL CONT PL
173	1138843		SCREW VEL CONT PL
174	1124707		SCREW, TAPE ANCHOR
175	1124573		ECCENTRIC,CONT PLA
176	1124572		PLATE, VEL CONTROL
177	1124708		SHAFT,ROCKER PIVOT
178	38250		SCREW,TAPE GUI MTG
179	1124219		GUIDE, TAPE
180	1124838		SUPPORT, DETENT LV
181	1124179		LEVER, DETENT ACT
182	2114985		NUT STRIKER MTG SC
183	1141323		SCREW, DET LEV MTG
184	1141235		YOKE, ASM
	WHEN REPLACING YOKE ON MACHINES BELOW 4053655 & 4365296 ORDER REF 190 ALSO		
185	263680		WASHER
186	1123588		SCREW, YOKE MTG
187	1124190		PIN, TILT RING PIN
188	1123828		SCREW,TILT RNG MTG
189	1127767		SHIM, TILT TUBE A
189	1127768		SHIM, TILT TUBE B
189	1127769		SHIM, TILT TUBE C
189	1141175		SHIM, TILT TUBE D
190	1124204		TUBE, TILT SECTOR
191	1141176		SHIM, LOWER BALL A
191	1127770		SHIM, LOWER BALL B
191	1127771		SHIM, LOWER BALL C
191	1127772		SHIM, LOWER BALL D
191	1127773		SHIM, LOWER BALL E
191	1127774		SHIM, LOWER BALL F
191	1164563		SHIM .025 GRLS TLT
192	1124197		SOCKET ASM LOWER B
193	1124220		JOINT, BALL
193	1164879		JOINT BALL 775
194	1141182		NUT, DETENT ADJUST
195	1141371		WASHER
196	1138353		SCREW DETENT GUIDE
197	45611		WASHER DETENT GU
198	1124831		GUIDE DETENT
199	1164285		LEVER ROTATE DET
200	1133574		RING ASM TILT
	TO INSTALL TILT RING ON 11 IN BELOW 4032020 AND 15 IN BELOW 4351475,ORDER REF 194 AND 195-FILE YOKE TO REMOVE INTERFERENCE WITH REF 194		
201	1266687		TILT RING ASM B/M
202	1133659		SPRING ROTATE DET
203	1138353		SCREW TILT RING S
204	1124188		SPACER TILT RING
205	1133529		SOCKET UPPER BALL
205	1164041		SOCKET UPPER BALL
	USE WITH 1164039 TILT RING		
205	1141997		SOCKET UP BALL
	USED ON STICK SHIFT ROCKER		
206	1123822		SHIM TILT RING A
206	1123823		SHIM, TILT RING B
206	1123824		SHIM, TILT RING C
206	1123825		SHIM, TILT RING D
206	1128281		SHIM, TILT RING E
206	1141144		SHIM, TILT RING F
207	*1134785		GUIDE, ROT DET RE
208	* 45611		WASHER,DETENT GUD

CODE 908
(6400 PRIMARY PRINTER ONLY)

CODE-508

JANUARY 7, 1966

PAGE 12

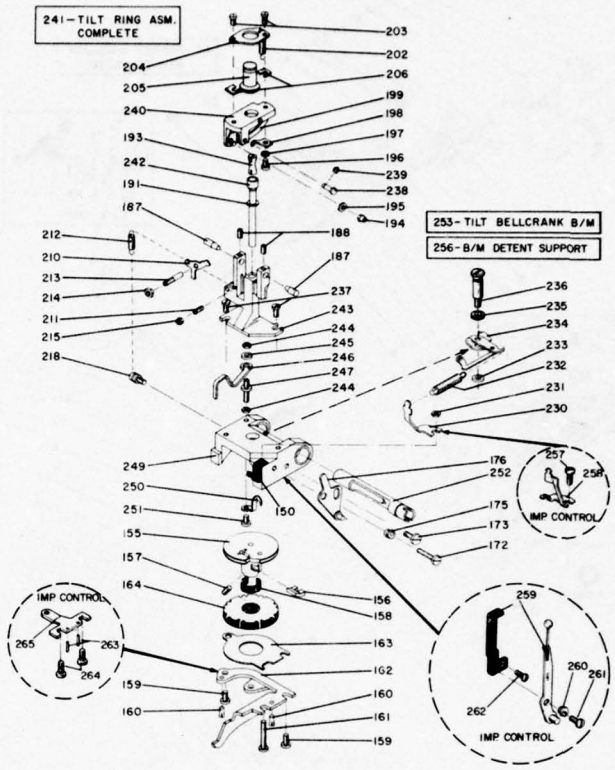
REF	P/N	SOURCE	DESCRIPTION
209	*1124835		SCREW, DET GUID RE
	*USED WITH OLD STYLE TILT RING		
210	1164151		LEVER TILT DETENT
	ON MACHINES BETWEEN SN 4602000 - 4603500 REQUIRES REPLACEMENT OF ROTATE-DETENT REF 199		
211	1124836		SCREW, TILT DET GU
212	1133658		SPRING, TILT DET
213	1124832		STUD, TILT DETENT
214	1090268		NUT, TILT DET STUD
215	1123785		NUT, TILT LEVER GU
216	1078497		WASHER,ROCKER BEAR
	USED WITH REF 217		
217	1141189		WASHER, NYLON
217	1127775		WASHER, THRUST
	USED BELOW 4036419 AND 4354172		
218	1124234		STUD, SPRING ANCHR
219	38261		SCREW, TILT SP MTG
220	1124224		ANCHOR, TILT SPRNG
221	1141199		ROCKER ASM, B/M
	INCLUDES YOKE, ROCKER & STRIKER SEE NOTE AFTER REF 184		
222	1134765		HEAD CAP, BLANK
223	1133517		CLIP, SPRING
	TYPEHEAD ASSEMBLY		
	CODE NUMBER IS LAST THREE DIGITS OF PART NUMBER		
224	1167050		ET CORRESPONDENCE
224	1167908		ET BCD
224	1167904		1014
224	1167916		1014 FAA
224	1167913		1415 PGRM H
224	1167914		1415 REPORT A
224	1167903		1415
224	1167910		SABRE AA
224	1167905		SABRE
224	1167902		STRETCH AEC
224	1167901		STRETCH ESC
224	1167907		1620
224	1167912		765 & 767
224	1167961		DATA #1 GOV CORR
224	1167962		DATA #1 GOV PROC.
224	1167950		1620 MODIFIED
224	1167909		DATA #2 KELLOGG
224	1167856		KATAKANA
224	1167963		835-935 CORRES
224	1167947		835-935 DATA #1
224	1167948		835-935 DATA #1
224	1167938		835-935 STANDARD
224	1167939		835-935 STANDARD
224	1167942		835-935 H OPTION
224	1167943		835-935 H OPTION
224	1167940		835-935 A OPTION
224	1167941		835-935 A OPTION
224	1167015		COURIER 10P
224	1167010		MANIFOLD 10P
224	1167019		MANIFOLD CANC ZERO
224	1167967		BCD 870 UC LC
224	1167968		BCD 870 UC LC
	REF 224 INCLUDES REFS 222 & 223		

REF	P/N	SOURCE	DESCRIPTION
230	1128456		BRKT, TILT SPRING
231	37913		NUT,STRIKER MTG SC
232	1128459		SPRING TILT PUL
233□□	1164158		WASHER TILT PUL
	NOT USED WITH PLASTIC PULLEY		
234□□	1164310		TILT PULLEY G.T.
235□□	1164099		WASHER FELT
236□□	1128455		STUD TILT PULLEY
	□□ON MCH BELOW 4604800 REQUIRES REP OF REF 233-234-235-236 INCLUDED IN B/M 1280498. TILT TAPE MUST ALSO BE REPLACED		
237	1164580		SCREW, YOKE MTG
238	1128451		STUD,TILT LINK
239	251989		RETAINER,TILT LINK
240	1164039		TILT RING
	USED ON IMP CONTROL C&R		
240	1128442		TILT RING
241	1280119		TILT RING ASM B/M
242	1128436		LOWER BALL SOCKET
242	1164550		LOWER BALL SOCKET
	USED ABOVE SN 4610347		
243	1128434		YOKE
244	1134842		NUT DETENT ACT ARM
245	□1128493		WASHER DET ACT ARM
246	□1128458		LEVER DET ACT
247	□1128495		SCREW DET ACT ARM
	□ON MACHINES BELOW 4603100 REPL OF ANY PART WILL REQUIRE ALL THREE-ORDER REF 256		
249	1128438		ROCKER
249	1141752		ROCKER
	USED ON IMP CONTROL C&R		
250	1128449		TAPE GUIDE, TILT
250	1164044		TAPE GUIDE
	USED ON IMP CONTROL C&R		
251	186712		SCREW,TAPE GUIDE
252	1128457		ROCKER PIVOT SHAFT
253	1280498		B/M TILT BELLCRANK INCLUDES REF 233-234-235-236
254	1141934		CAP BLANK
255	1141935		CLIP SPRING
256	1272176		B/M DETENT SUPPORT
257	38565		SCREW BKT MTG
258	1141625		BRACKET TILT B/C S
259	1141757		LEVER ASSEMBLY
260	1141759		ECCENTRIC VEL CONT
261	338238		SCREW VEL CON ECC
262	1164580		SCREW BKT ADJUST
263	1132118		DOWEL STRIKER
264	1164580		SCREW STRIKER MTG
265	1141632		BEARING LOWER

CODE 908
(6400 PRIMARY PRINTER ONLY)

CODE-508

ROCKER (GEARLESS TILT)



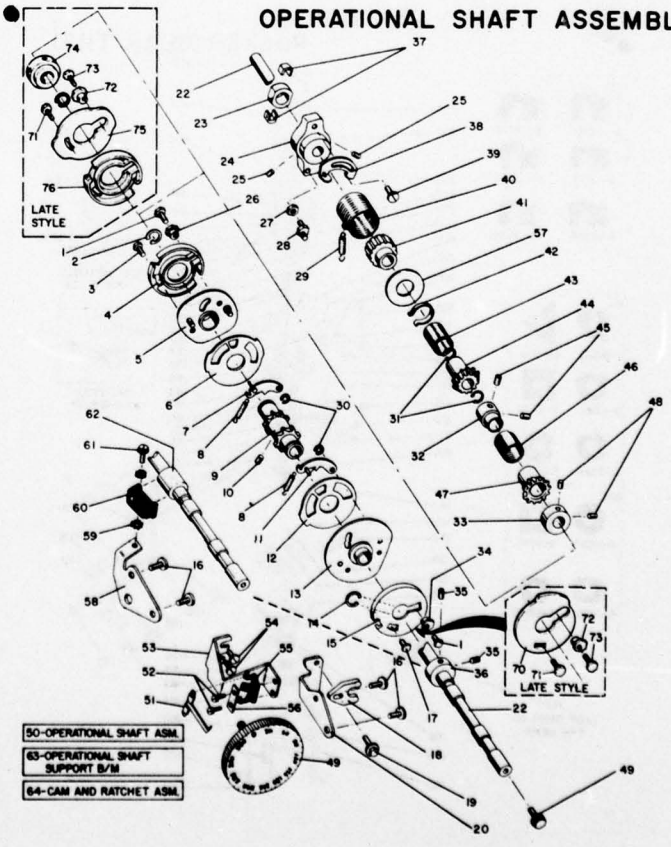
REF	P/N	SOURCE	DESCRIPTION
1	1141233		SCREW, CHECK RING
2	324221		CLIP C OPER CAM
3	1164582		SCREW, CHECK RING
4	*1141134		RING, CHECK CAM
5	*1159267		CAM SB/BS/TAB
6	1135570		WHEEL SB/BS/TAB
7	1166217		PAWL CAM SB/BS/TAB
8	1132064		SPRING PAWL
9	*1159269		RATCHET OPR CLUTCH
10	257969		SCREW OPR CLUTCH
11	1128413		PAWL CR/INDEX
12	1123566		WHEEL CR/INDEX
13	*1159886		CAM CR/INDEX
14	324221		CLIP C OPR CAM
15	*1123594		RING CR/INDEX
16	1164577		SCREW BRKT MTG
17	1164582		SCREW CHECK RING
18	1138116		SUPPORT CAM SHAFT
19	1128326		SCREW OPR BKT SUPP
20	REF ONLY IF REPL IS NECESSARY ORDER REF 58,59,60,61,&62 AND CONVERT		
22	1123559		SHAFT OPR CAM 11
22	1128161		SHAFT OPR CAM 15
22	1144787		SHAFT 767
23	1123579		SLEEVE, HUB TORQUE
24	1133548		HUB TORQUE LIMITER
25	257975		SCREW, HUB TORQUE
26	*1123593		ECCENTRIC CK RING
27	37913		NUT, STUD TORQUE
28	1132060		STUD, TORQUE LIMIT
29	1124290		SPRING, EXTENSION
30	1073418		CLIP C PAWL RETAIN
31	324497		CLIP C PINION RET
32	1123573		HUB, TAB GOV
33	1123582		COLLAR TAB GOV PIN
33	1144915		COLLAR 767
34	*1123593		ECCENTRIC CK RING
	*BELOW SN 4609595 REPLACEMENT OF ANY PART REQUIRES REPLACEMENT OF ALL PARTS USE B/M 1272677 REF 64		
35	1100523		SCREW COLLAR
36	1123582		COLLAR OPR 15 IN
37	1133583		INSERT, HUB TORQUE
38	1123580		CLAMP, TORQUE SPRG
39	265195		SCREW, CLAMP TORQ
40	1123581		SPRING, TORQUE
41	1123575		ARBOR,TORQUE LIMIT
42	1123577		CLAMP, CR SPRING
43	1123576		SPRING, CR CLUTCH
43	1144784		SPRING 767
44	1123574		PINION CR
44	1144756		PINION CR 767
45	1100523		SCREW TAB GOV HUB
46	1123572		SPRING TAB GOV
47	1123571		PINION TAB GOV
47	1144759		PINION TAB 767
48	1100523		SCREW GOV COLLAR
49	1135233		SCREW TURNING OPR
49	1145391		WHEEL DEGREE 767
50	1276250		SHAFT ASM 767
51	1135084		POINTER
52	38262		SCREW POINT MTG

REF	P/N	SOURCE	DESCRIPTION
53	1145390		BRACKET IND 767
54	1164577		SCREW BRKT MTG
55	1124702		BRACKET POINTER
56	1134888		WASHER POINTER
57	1159878		RETAINER GREASE
58	1135511		BRACKET SUPPORT
59	56722		WASHER STAR
60	1159843		SUPPORT CAM SHAFT
61	1128326		SCREW
62	1159844		BUSHING SHFT SUPP
63	1272675		OPR SHAFT SUPP B/M
64	1272677		CAM AND RATCHET A
64**	1272915		CAM & RATCHET ASM
	**USED WITH LATE STYLE OPR CONTACTS		
70	□1159964		CAM CONT OPERATING
71	□1123588		SCREW CK RING MTG
72	□1159948		ECC CHECK RING
73	□1159955		SCREW ECC LOCKING
74	□1159935		COLLAR TAB GOV PIN
75	□1159965		CAM CONTACT OPR
76	□1166309		CHECK RING BS/SB
	□PARTS USED WITH LATE STYLE POSITIVE ACTION OPR CONTACTS		
80	1166372		SCREW CHECK RING

CODE 910
(6400 PRIMARY PRINTER ONLY)

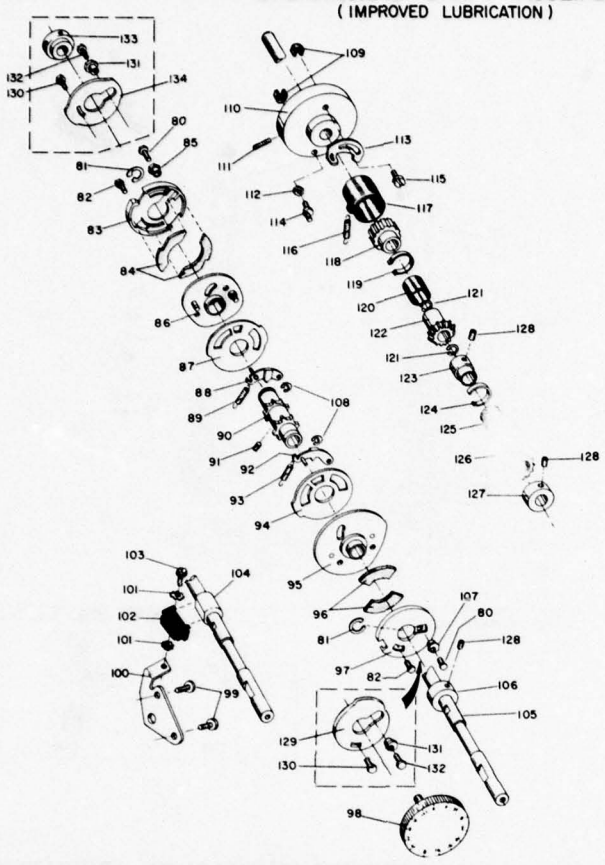
CODE-510

OPERATIONAL SHAFT ASSEMBLY



JANUARY 7, 1966

OPERATIONAL SHAFT ASSEMBLY
(IMPROVED LUBRICATION)

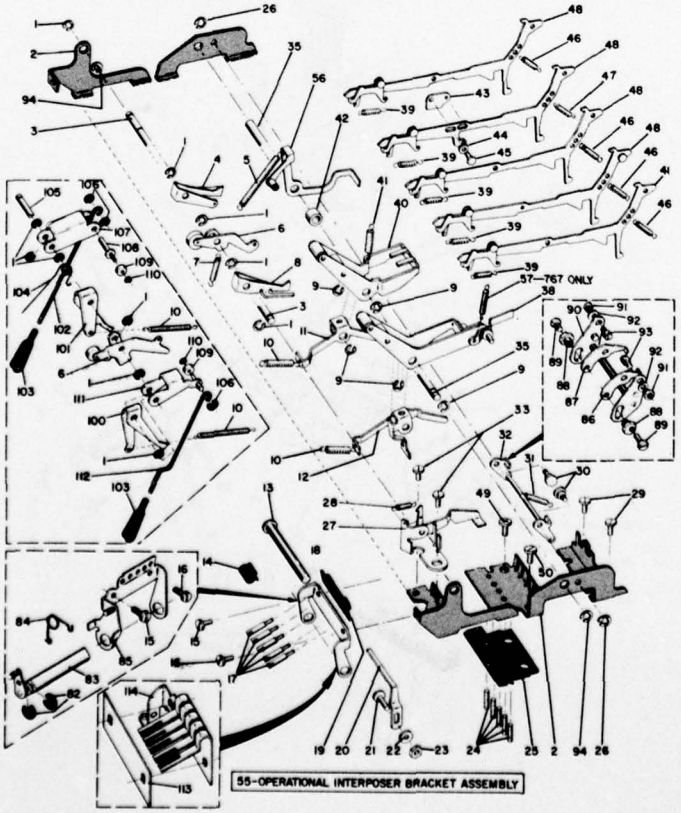


REF	P/N	SOURCE	DESCRIPTION
81	324221		C CLIP OPER CAM
82	1166373		SCREW CK RING LOCK
83	1166387		RING CHECK - GREEN
84	1166388		WICK OIL
85	1123593		ECCENTRIC CK RING
86	1159267		CAM SB/BS/TAP
87	1123570		WHEEL SB/BS/TAB
88	1166217		PAWL CAM SB/BS/TAB
89	1132064		SPRING PAWL
90	1159269		RATCHET OPR CLUTCH
91	257969		SCREW RATCHET
92	1128413		PAWL CR/INDEX
93	1132064		SPRING PAWL
94	1123566		WHEEL CR/INDEX
95	1159886		CAM CR/INDEX
96	1166383		WICK OIL
96	1166559		OIL WICK-LONG
97	1166382		RING CK - YELLOW
98	1145391		WHEEL DEGREE
99	1164577		SCREW BRKT MTG
100	1135311		BRACKET SUPPORT
101	56722		WASHER STAR
102	1159843		SUPPORT CAM SHAFT
103	1128326		SCREW SUPPORT
104	1159844		BUSHING SHAFT SUPP
105	1166365		SHAFT OPR 11 IN
105	1166366		SHAFT OPR 15 IN
105	1144787		SHAFT OPR 767
106	1123582		COLLAR OPR SHAFT
107	1123593		ECCENTRIC CK RING
108	1073418		RETAINER PAWL
109	1166231		INSERT HUB TORQUE
110	1166230		HUB TORQUE LIMITER
111	257979		SCREW HUB TORQUE
112	257187		NUT STUD TORQUE
113	1123580		CLAMP TORQUE SPRNG
114	1159674		STUD TORQUE LIMIT
115	265195		SCREW CLAMP TORQ
116	1141650		SPRING EXTENSION
117	1123581		SPRING TORQUE
118	1159654		ARBOR TORQUE LIMIT
119	1123577		CLAMP CR SPRING
120	1123576		SPRING CR CLUTCH
120	1144784		SPRING CR 767
121	324497		CLIP C PINION RET
122	1123574		PINION CR
122	1144756		PINION CR 767
123	1123573		HUB TAB GOV
124	1166555		CLAMP TAB SPRING
125	1123572		SPRING TAB GOV
126	1123571		PINION TAB GOV
126	1144759		PINION TAB GOV 767
127	1123582		COLLAR TAB GOV PIN
127	1144915		COLLAR 767
128	1100523		SCREW SET
129	□1159964		CAM CONT OPERATING
130	□1123588		SCREW CK RING MTG
131	□1159948		ECC CHECK RING
132	□1159955		SCREW ECC LOCKING
133	□1159939		COLLAR TAB GOV PIN
134	□1159965		CAM CONTACT OPR
	□PARTS USED WITH LATE STYLE POSITIVE ACTION OPR CONTACTS		
135	1272677		CAM AND RATCHET A
135	1272915		CAM AND RATCHET A INCLUDES REF 129,130,131,132 &134

CODE 910
(6400 PRIMARY PRINTER ONLY)

CODE-510

OPERATIONAL BRACKET ASSEMBLY



REF	P/N	SOURCE	DESCRIPTION
1	1092125		CLIP C CK PWL SHFT
2	1132084		BRACKET, OPERATION
3	1123585		SHAFT CHECK PAWLS
4	1159125		PAWL BS CAM CHECK
5	1117589		SPRING, CAM FOL
	USED WITH REF 104		
5	126572		SPRING CAM FOLL
	USED WITHOUT REF 104		
6	1123591		FOLLOWER, CAM
7	1090404		SPRING, CAM FOLLOW
8	1159126		PAWL CR CAM CHECK
9	1092125		CLIP C SHAFT
10	23106		SPRING REL LEVER
11	1132074		ARM BS CLU RELEASE
12	1123819		ARM CR CLU RELEASE
13	□1141195		PIN
14	□1141194		RETAINER
15	1164578		SCREW PAWL GUIDE
15	1164582		SCREW PAWL GUIDE
	USED ON MACHINES BELOW 4064000		
16	1164578		SCREW PAWL GUIDE
17	1133584		STUD, PAWL GUIDE
18	□1141208		GUIDE
	□MUST BE USED TOGETHER		
19	1132117		RETAINER, PWL STUD
20	1128660		STOP, KEYLEVER PWL
21	35739		SCREW, 11 INCH
21	38348		SCREW, 15 INCH
22	1124461		WASHER, COVER SCR
23	257187		NUT, COVER MTG SCR
24	1132098		SCREW, INTERPOSER
25	1134712		CLIP, INTPOSER SCR
26	*1141141		RETAINER,REST STUD
27	1138454		LEVER ASM,SB INTLK
28	167790		SPRING,SB LOCKOUT
28	1124206		SPRING B70
29	1164577		SCREW OPR BRKT
30	*1134937		STUD,RESTORE LEVER
	*MAY BE USED IN PLACE OF STUD AND NUT ON MACHINES BELOW 4010750		
31	1074242		SPRING
32	1132078		LEVER RESTORE
33	1127733		SCREW OPER BRKT
	CONTACT ASM,OPER FEEDBACK C5 & C6		
34	1128688		ET 11 IN MACHINE
34	1135308		C5 ET 15 INCH
34	1135306		C6 ET 15 INCH
34	1135405		870,1014, 11 IN
34	1128848		1415 7040/7044
34	1128688		SABRE, STRETCH
34	1144637		ASM C-5 767
34	1145453		ASM C-6 767
34	1159499		C-5 870 775 15 IN
34	1159498		C-6 870 775 15 IN
35	1141162		SHAFT CAM FOLLOW
	USE WITH REF 40 ONLY		
35	□1124509		SHAFT CAM FOLLOW
	□USED BELOW 4082837 AND 4380630		
36	35739		SCREW, CONTACT MTG
36	1166041		SCREW CONTACT MTG
	USED WITH LATE STYLE OPR CONTACTS		
37	1164576		SCREW CONTACT MTG
38	1128692		FOLLOWER TWO PIECE
38	1135173		FOLLOWER ASM, CR
38	1144920		FOLLOWER 767
39	1073863		SPRING, INTERPOSER
40	1124508		FOLLOWER ASM, BS
41	1090162		SPRING, CAM FOLLOW
42	1074556		SPACER, CAM FOLLOW
43	1138805		KEEPER, SB
44	1090475		WASHER, SB KEEP SC
45	1127714		SCREW, SB KEEPER
46	1134948		SPRING BS TAB CR / INDEX INTERPOSERS
47	150047		SPRING SB INTPOSER
48	SEE APPROPRIATE MECHANISM		
49	364816		SCREW, OPER BKT
50	322065		SCREW, OPER BKT
55	1135408		ASM OPER BKT
	USED ON 731,735,775,1014,1620		
55	1135449		ASM OPER BKT
	USED ON 1415,7040/44,SABRE		
55	1135704		ASM OPER BKT 765
55	1145356		ASM OPER BKT 767
56	1135211		FOLLOWER ASM AUX
56	1159312		FOLLOWER-USED WITH ADJUSTABLE RESTORE BAIL
57	1145491		SPRING CAM FOL 767
82	264641		C-CLIP
83	1159244		LEVER LOCK OUT
84	1159240		SPRING TOGGLE
85	1159246		GUIDE KEYLEVER
86	1159307		LEVER CR RESTORE
87	1159306		LEVER BS RESTORE
88	1123593		ECCENTRIC
89	1128382		SCREW ECC ADJ
90	1159301		LEVER RESTORE
91	38214		NUT
92	338169		WASHER LOCK
93	1159308		STUD LEVER
94	1132122		CLIP SPRING
100	1123586		PAWL CR CAM CHECK
101	1166307		PAWL BS CAM CHECK
102	1159954		LINK CONT ACT LH
103	1070020		CLEVIS
104	FOR REFERENCE ONLY - REPLACE SPRING AND ADJACENT C-CLIP WITH SPACER 1078653 ALSO CHANGE REF 5		
105	1159960		SHAFT CK PAWL
106	1073418		RETAINER
107	1159949		ARM FOLL BS CONT
108	1159947		STUD BS FOLL ROLL
109	1159952		ROLLER CAM FOLL
110	469565		RETAINER
111	1159942		ARM ASM FOLL CR
112	1159950		LINK CONT ACT RH
113	1164720		PLATE 767
114	1164556		GUIDE 767

CODE 911
(6400 PRIMARY PRINTER ONLY)

CODE-511

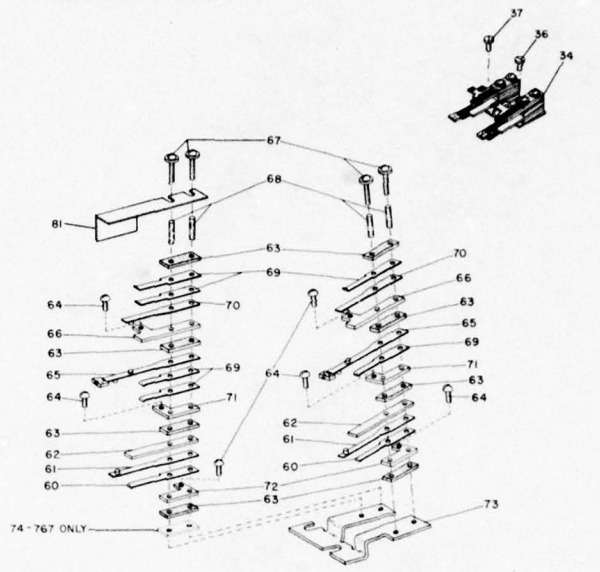
PAGE 14

REF	P/N	SOURCE	DESCRIPTION
60	1135467		SPRING BACKUP
60	339113		SPRING 767
61	1128745		CONTACT, ALL MODEL
	ALL MODELS EXCEPT 1014		
61	1135476		CONTACT 1014
62	326119		SUPPORT STRAP
63	37435		INSULATOR PLATE
64	118418		SCREW TERMINAL
65	1128744		CONTACT STRAP
	ALL MODELS EXCEPT 1014		
65	1135482		CONTACT STRAP 1014
66	1128743		TERMINAL CONTACT
67	173205		SCREW, MTG
68	100229		INSULATOR
69	1135466		SPRING, BACKUP
69	339113		SPRING 767
70	1128746		CONTACT STRAP
	ALL MODELS EXCEPT 1014		
70	1135474		CONTACT STRAP 1014
71	339109		TERMINAL CONTACT
72	339109		TERMINAL CONTACT
73	1128689		BRACKET
	ALL MODELS EXCEPT 15 INCH		
73	1135309		BRACKET C5 15 INCH
73	1135307		BRACKET C6 15 INCH
73	1144638		BRACKET C-5 767
74	1144636		PLATE 767
75	1164577		SCREW C-5 MTG 767
76	1145468		BRACKET C-6 767
77	438552		SCREW C-6 MTG 767
78	1143616		SPACER C-6 MTG 767
81	1159536		SHIELD C-5
	MUST USE WITH 100 IN MAINSPRING PN 1164342		

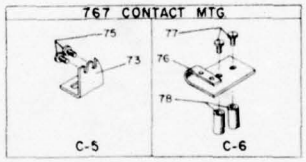
CODE 911
(6400 PRIMARY PRINTER ONLY)

CODE-511

FEED BACK CONTACT ASSEMBLY



34-FEEDBACK CONTACT ASM. C-5, C-6

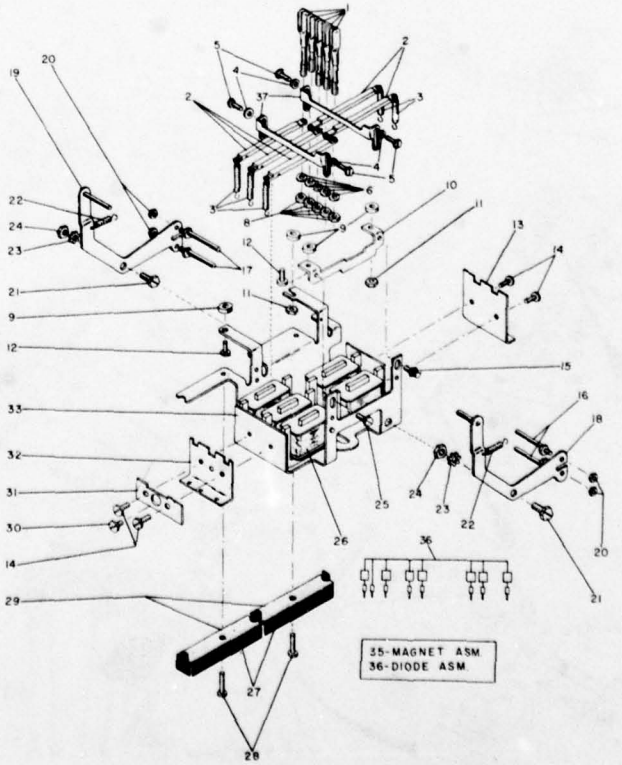


REF	P/N	SOURCE	DESCRIPTION
1	*1135193		LINK ASM-SPACE
	FOR EARLY LEVEL USE PN 1128684		
1	*1128684		LINK ASM-OTHER
2	1128682		ARMATURE OPR MAG
3	1100938		SPRING OPER M ARM
4	355341		WASHER BACKSTOP SC
5	1128698		SCREW BACKSTOP MTG
6	1166304		WASHER SHOCK ABS
8	*1159716		NUT PULL LINK
	*WHEN REPLACING REF 1 ORDER REF 8 ALSO-PREVIOUS STYLE PARTS NO LONGER AVAILABLE		
9	1128598		SPACER OPER MAG
10	1128686		SUPPORT OPER MAG A
11	38051		NUT OPER MAG A MTG
12	1164577		SCREW OPER MAG MTG
13	1128680		PLATE PIVOT REAR
14	1164582		SCREW PIVOT PL MTG
15	1124234		SCREW MTG BKT SPR
15	1144929		STUD 767
16	1128713		BAIL RH OPER CONT
17	1128712		BAIL LH OPER CONT
18	1128710		ARM RH OPER CONT B
19	1128707		ARM LH OPER CONT B
20	27073		NUT OPER CONT BAIL
21	1128714		SCREW PIVOT BAIL A
22	10514		SPRING BAIL ARM
23	56722		WASHER LOCK BAIL A
24	38051		NUT BAIL ARM MTG
25	1164578		SCREW OPER MAG SUP
26	1135134		COIL A MAGNET 48V
26	1266894		COIL A MAGNET 24V
27	302090		BLOCK A TERMINAL
28	438549		SCREW, TERM BLOCK
29	302131		INSULATOR TERM BLK
30	1164578		SCREW BS ARM PIVOT
31	1135169		PLATE, ARM PIVOT
32	1128679		PLATE, ARM PIVOT
33	1128676		FRAME, OPER MAG
35	1128675		MAGNET ASM STRETCH 48V
35	1135022		MAGNET A ALL OTHER 48V
35	1266895		MAGNET ASM 24V
36	1135016		DIODE ASM OPER MAG COMMON ANODE
36	1128545		DIODE ASM STRETCH
36	333264		DIODE SINGLE STRET
36	1128544		BRACKET DIODE STRT
36	1145475		DIODE ASM 765 COM CATH 4 DIODES
36	1145414		DIODE ASM 767 COM CATH 6 DIODES

CODE 912
(6400 PRIMARY PRINTER ONLY)

CODE-512

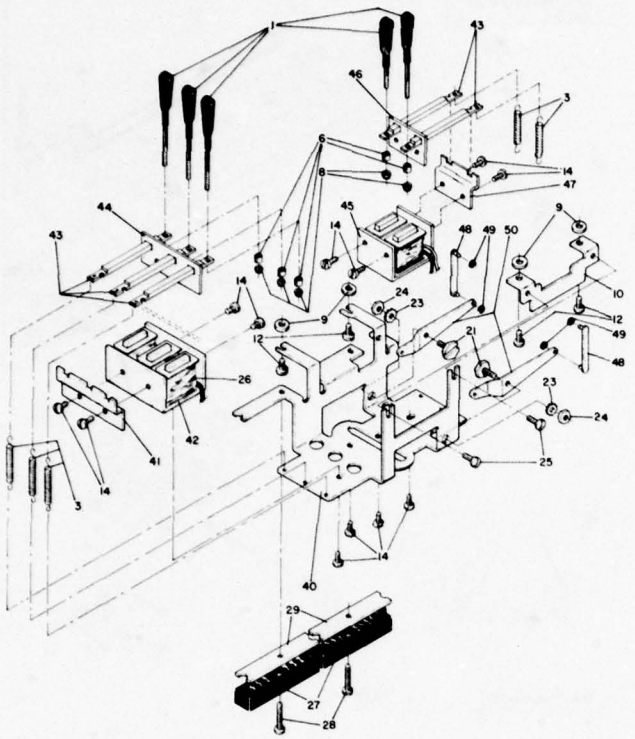
OPERATIONAL MAGNET ASSEMBLY



35-MAGNET ASM.
36-DIODE ASM.

JANUARY 7, 1966

OPERATIONAL MAGNET ASSEMBLY



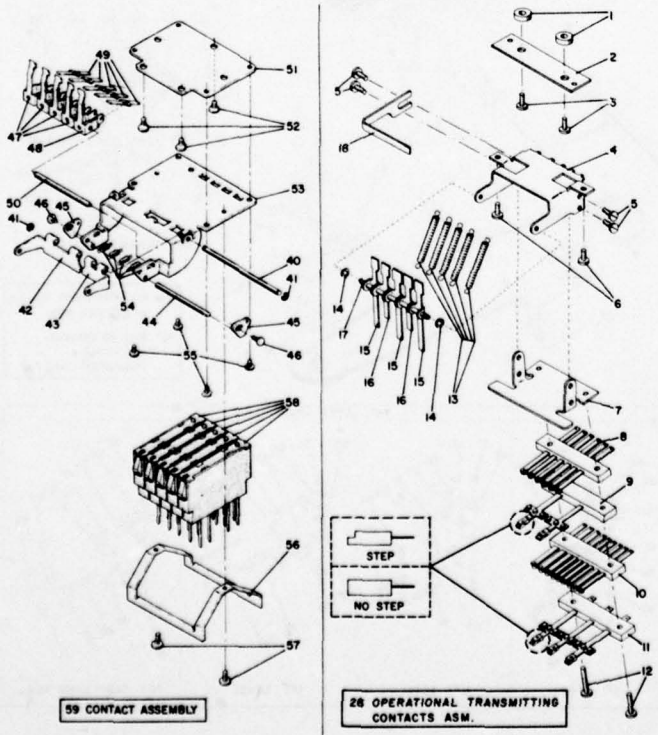
REF	P/N	SOURCE	DESCRIPTION
37	1128683		BACKSTOP OPER ARM
40	1159992		FRAME OPR MAG MTG
41	1159834		PIVOT PLATE OPR
42	1159833		BRKT ASM OPR FRONT
	BRKT ONLY FOR COILS SEE REF 26		
43	1159829		ARMATURE OPR
44	1159835		BACKSTOP OPR ARM
45	1159842		BRKT ASM OPR REAR
	BRKT ONLY FOR COILS SEE REF 26		
46	1159832		BACKSTOP OPR ARM
47	1159841		PIVOT PLATE OPR
48	1159945		LINK ASM
49	219633		RETAINER
50	1159958		ARM CONTACT ACT

REF	P/N	SOURCE	DESCRIPTION

CODE 912
(6400 PRIMARY PRINTER ONLY)

CODE-512

OPERATIONAL CONTACT LATCH ASSEMBLY



59 CONTACT ASSEMBLY

26 OPERATIONAL TRANSMITTING CONTACTS ASM.

REF	P/N	SOURCE	DESCRIPTION
1	1128598		SPACER OPR CONT A
2	1135237		PLATE OPER CONT A
3	1164576		SCREW OPER LAT PLT
4	1128706		BRACKET OPR CONT S
5	1164580		SCREW OPR CONT SUP
6	1164578		SCREW OPR CONT ASM
7	1128697		SUPPORT OPER CONT
8	1128663		CONTACT STRAP TOP
9	1128666		CONTACT 2ND FROM T
9	1135489		OPR CONT NO STEP
10	1128669		CONTACT 3RD FROM T
11	1128694		CONTACT BOTTOM
11	1135490		OPR CONT NO STEP
12	173205		SCREW CONT MTG
13	1135431		SPRING CONT LATCH
14	219633		C CLIP OPER CONT
15	1128703		LATCH LONG
15	1135487		LATCH LONG NO STEP
16	1128704		LATCH SHORT
16	1135488		LATCH SHRT NO STEP
17	1128705		ROD LATCH PIVOT
18	1135430		STOP CONTACT LATCH
28	1128661		ASSEMBLY CONT/LATH
28	1262790		CONTACT ASM ONLY
40	1159953		SHAFT ACTU ARM
41	469565		RETAINER
42	1159956		ACTUATOR CONT LH
43	1159957		ACTUATOR CONT RH
44	1159938		SHAFT LATCH SPRING
45	1159941		PLATE LATCH ADJ
46	1158353		SCREW ADJ PLATE
47	1159966		FOLL INTERPOSER LH
48	1159967		FOLL INTERPOSER RH
49	1159951		CONTACT LATCH
50	1159940		SHAFT FOLLOWER
51	1159959		PLATE ADAPTER
51	1145582		PLATE ADAPT 767
52	478394		SCREW ADAP PLATE
53	1159961		BRACKET CONTACT
53	1145581		BRACKET CONT 767
54	1090343		SPRING LATCH
55	1164578		SCREW MTG PLATE
56	1159963		CLAMP OPR CONT
57	1164582		SCREW CLAMP
58	1159937		CONTACT BLOCK ASM
59	1166042		CONTACT ASM
59	1176947		CONTACT ASM 835

REF	P/N	SOURCE	DESCRIPTION

CODE 913
(6400 PRIMARY PRINTER ONLY)

CODE-513

PAGE 16

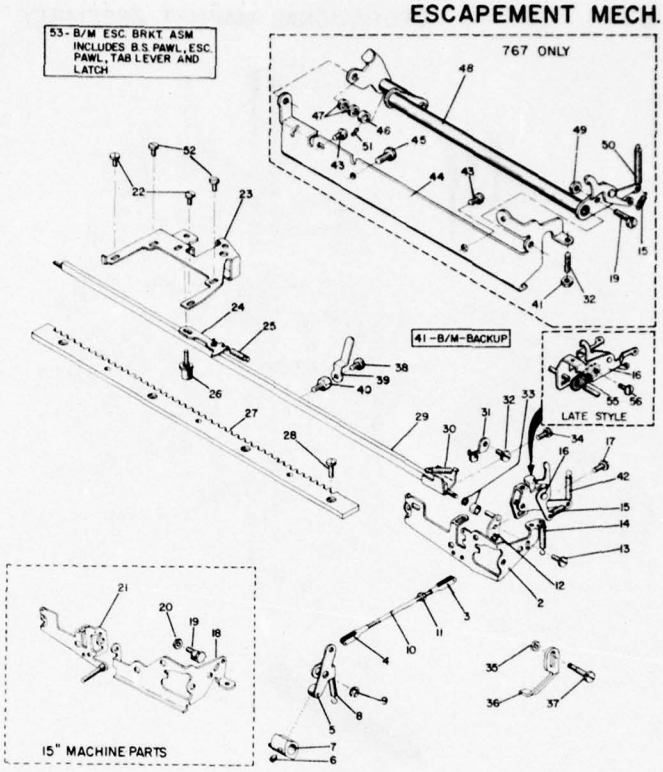
REF	P/N	SOURCE	DESCRIPTION
2	1135093		BRACKET ASM 11 IN
2	1159367		BRACKET ASM 11 IN
	ABOVE SN 4615351		
3	1110529		CLEVIS PIN
4	1127727		CLEVIS PIN
5	1123591		FOLLOWER CAM
6	257969		SCREW CAM SET
7	1124538		CAM ESCAPEMENT
	USE BELOW 11 IN 4064000 AND 15 IN 4370500		
7	1138452		CAM ESCAPEMENT
8	1090162		SPRING CAM FOLLOW
9	1092125		C-CLIP CAM STUD
10	1123831		LINK ESCAPEMENT
11	1127728		NUT ESCAPE LINK
12	*1123774		GUIDE ASM TRIGGER
	FOR NEW STYLE SEE REF 19 AND 20		
13	* 38562		SCREW TRIG GUIDE
14	123491		SPRING TRIG 11 IN
15	*1134884		SPRING TRIG 11 IN
15	1138795		SPRING TRIG
16	1159369		TRIGGER ASM 11 IN
	ABOVE SN 4615351		
16	1159325		TRIGGER ASM 15 IN
	ABOVE SN 4612100		
16	1133511		TRIGGER ASM 11 IN
16	1128101		TRIGGER ASM 15 IN
16	*1124469		TRIGGER ASM 11 IN
17	1127733		SCREW BRACKET
18	1128366		BRACKET RH 15 IN
18	1159338		BRACKET RH 15 IN
	ABOVE SN 4612100		
19	1128226		STUD TRIGGER GUIDE
20	37913		NUT TRIG GD STUD
21	1135314		BRACKET LH 15 IN
22	1141928		SCREW ESC BKT FNT
23	1141639		BRACKET ESCAPEMENT
	USED ON IMP CONTROL C&R		
23	1124087		BRACKET ESCAPEMENT
23	1141532		BRACKET ESC USED
			WITH TAB GANG CLER
23	1145410		BRACKET ESC 767
	GANG CLEAR-MACHINES PRIOR ORDER B/M 1276145 ALSO AND CONVERT		
24	1128201		PAWL ESCAPEMENT
25	1123827		SPRING PAWL
26	1124098		STUD PAWL MTG
26	1128301		STUD PAWL MTG
	USED ABOVE 4086500 11 IN AND 4386000 15 IN		
27	1124083		RACK 10P 11 IN
27	1124109		RACK 12P 11 IN
27	1128032		RACK 10P 15 IN
27	1128037		RACK 12P 15 IN
27	1144785		RACK RH 10P 767
27	1144786		RACK LH 10P 767
28	1124084		SCREW RACK
29	1141212		BAR ASM TORQ 11 IN
	USED ABOVE SN 4057225		
29	1132282		BAR ASM TORQ 11 IN
	USED BETWEEN SN 4057225 & 4012015		
29	*1132276		BAR ASM TORQ 11 IN
29	1141220		BAR ASM TORQ 15 IN
	USED ABOVE SN 4367458		

REF	P/N	SOURCE	DESCRIPTION
29	1128107		BAR ASM TORQ 15 IN
29	1144754		BAR TORQUE 767
29	1272222		BAR ASM TORQ 11 IN
	BELOW SN 4065000		
29	1272223		BAR ASM TORQ 15 IN
	BELOW SN 4375600		
30	1100936		SPRING TORQ BAR
30	* 123491		SPRING TORQUE BAR
	*USED ON 11 IN BELOW 4012015		
30	1144928		SPRING T BAR 767
31	1128216		STOP TORQUE BAR
32	1127733		SCREW STOP
33	219633		C-CLIP TORQUE BAR
33	1141223		RETAINER
34	1127733		SCREW BKT MTG
35	257187		NUT STUD
36	1128204		UPSTOP TRIG 15 IN
37	1128113		STUD TRIGGER STOP
38**	1164582		SCREW
39**	1128400		STOP TORQUE BAR
40**	1128401		STUD
41	1272464		B/M STOP
	**MUST BE REPLACED WHEN REPLACING ANY ONE PART OF FORMER STYLE ORDER REF 41		
42	1141073		SPRING TRIG 15 IN
43	1127733		SCREW TRG BKT MTG
44	1144767		BRACKET RH LATCH
45	803278		SCREW
46	1144937		COLLAR
47	45638		SPACER
48	1144824		LEV ASM SB TRIG
49	37913		NUT TRIG GUIDE STD
50	1141073		SPRING TRIG RES
51	257957		SCREW COLLAR
52	1164027		SCREW REAR
53	1272185		B/M ESC BKT
53	1276137		B/M ESC BKT 767
55	1159375		PLATE TRIGGER ADJ
	ABOVE SN 4615351 11 IN		
56	108114		SCREW TRIG ADJ PL
	ABOVE SN 4612100		

CODE 915
(6400 PRIMARY PRINTER ONLY)

CODE-515

ESCAPEMENT MECH.



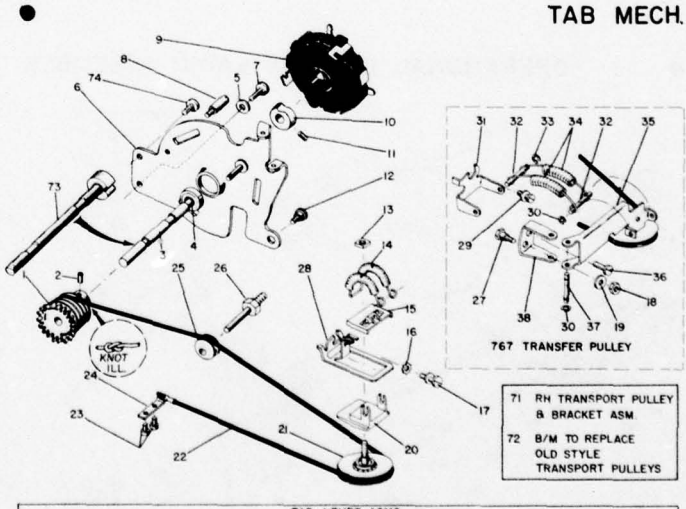
REF	P/N	SOURCE	DESCRIPTION
1	1124641		ESC CORD DRUM 11IN
1	1128108		ESC CORD DRM 15 IN
1	1144764		ESC CORD DRUM 767
2	1100523		SCREW CORD DRUM
2	1145479		SCREW 767
3	1124462		SHAFT ESCAPEMENT
3	1144864		SHAFT ESC 767
4	1124506		BEARING
4	1145359		BEARING 767
5	1141678		SPACER
6	1124503		PLATE, BACK
6	1128368		PLATE BACK
	ABOVE SN 4615351 11 IN AND 4612100 15 IN		
7	1164579		SCREW BOTTOM
8	1133584		STUD, STOP
9	1124519		SPRG ASM MAIN
9	1164342		SPRING ASM 100 IN
9	1144821		SPRG ASM MAIN 767
10	1141300		HUB ESC SPRING
10	1144863		HUB ESC SPRING 767
11	1100523		SCREW ESC HUB
12	1127733		SCREW BACKPLATE
13	1134829		NUT LOAD SPRG MTG
14	1128387		SPRING TRANS LOAD
15	1128386		PIVOT TRANS SPRING
16	56722		WASHER LOCK
17	1141936		SCREW BAIL LV PIV
20	1128385		SLIDE PULLEY
21	1124634		PULLEY RH TRANSPT
22	1166413		CORD TAB 11 IN
22	1166414		CORD TAB 15 IN
22	1144853		CORD TAB 767
23	1164580		SCREW 767
23	* 38262		SCREW TAB CORD ANC
24	*1124629		ANCHOR TAB CORD
24	*1145424		ANCHOR CORD 767
	*FOR ANCHOR AND SCREWS USED WITH IMP CONTROL C&R SEE CODE 508 REF 74 & 75		
25	1124628		PULLEY IDLER
26	1124624		STUD FRONT IDLER
28	1141979		BRACKET RH
29	1124394		SCREW BAIL LEV RH
30	219633		C-CLIP
31	1127798		BRACKET SPRING
32	1127796		SHAFT PULLY SPRING
33	219633		C-CLIP
34	1127794		SPRING TRANSPORT
35	1124643		PULLEY ASM PIVOT
35	1144968		PULLEY 767
36	38350		SCREW PIVOT BKT
37	1124630		PIN PIVOT PULLEY
37	1144989		PIN 767
38	1124639		BRACKET PIVOT PUL
39	1124098		STUD PAWL MTG
40	1128770		WASHER TAB LEVER
41	1128768		LEVER TAB
42	1135204		SPACER TAB LEVER
43	1124095		NUT TAB LEVER MTG
44	1124247		WASHER LO LV SCR
45	15887		SCREW LOCKOUT LEV

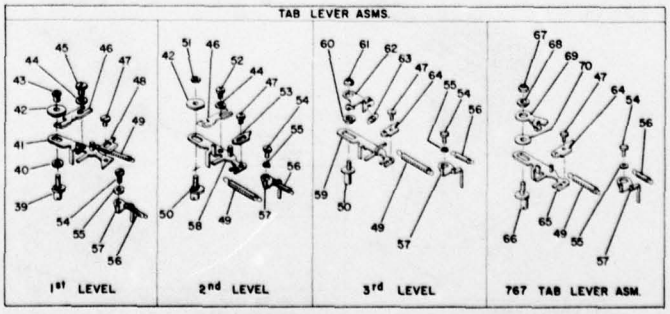
REF	P/N	SOURCE	DESCRIPTION
46	1128762		LEVER TAB LOCKOUT
47	1138802		SCREW TAB PAWL
48	1132097		PAWL TAB LEVER
49	1091670		SPRING TAB LEVER
50	1128301		STUD PAWL MTG
	ABOVE 11 IN 4086400 AND 15 IN 4383600		
51	37913		NUT TAB LEVER MTG
52	358174		SCREW LOCKOUT LEV
53	1138801		PAWL TAB LEVER
54	1132080		SCREW LATCH
55	1132103		BUSHING TAB LATCH
56	1073449		SPRING
57	1145516		LATCH TAB LEVER
58	1135195		LEVER ASM TAB
59	1138499		LEVER ASM TAB
60	1128291		SPACER
61	1128290		NUT
62	1159201		TRIGGER
63	1072949		SPRING TAB TRIGGER
64	1138801		PAWL TAB LEVER
65	1144878		TAB LEVER
66	1124098		PAWL MTG STUD
67	1144886		NUT
68	1144887		SPACER
69	1144888		LEVER TAB LOCKOUT
70	1144885		SPACER
71	1280081		TRANS PLY & BKT
72	1271973		B/M TRANS PULLY AS
73	1164561		SHAFT ASM 1 PIECE
74	1141846		SCREW TOP
74	1164579		SCREW 767 TOP

CODE 916
(6400 PRIMARY PRINTER ONLY)

CODE-516

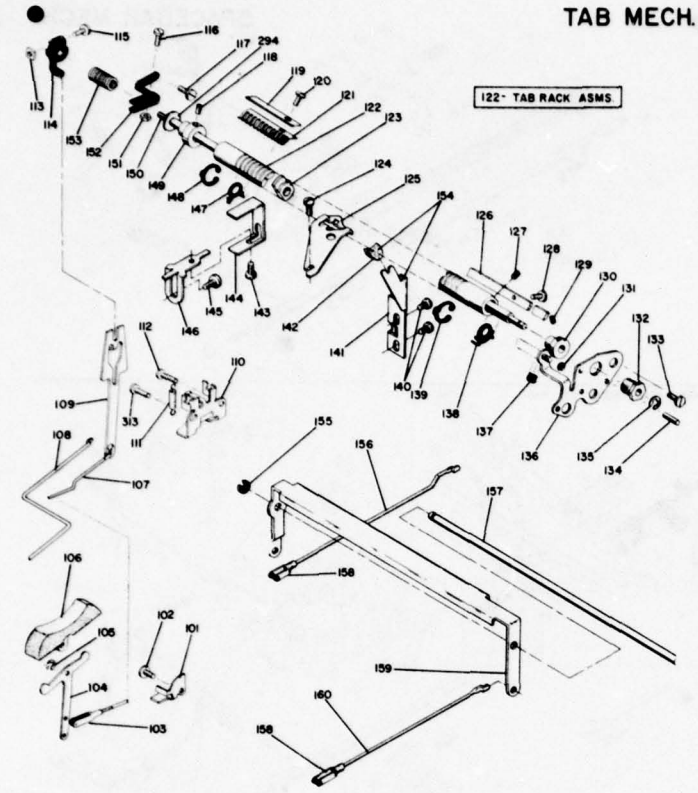
TAB MECH.



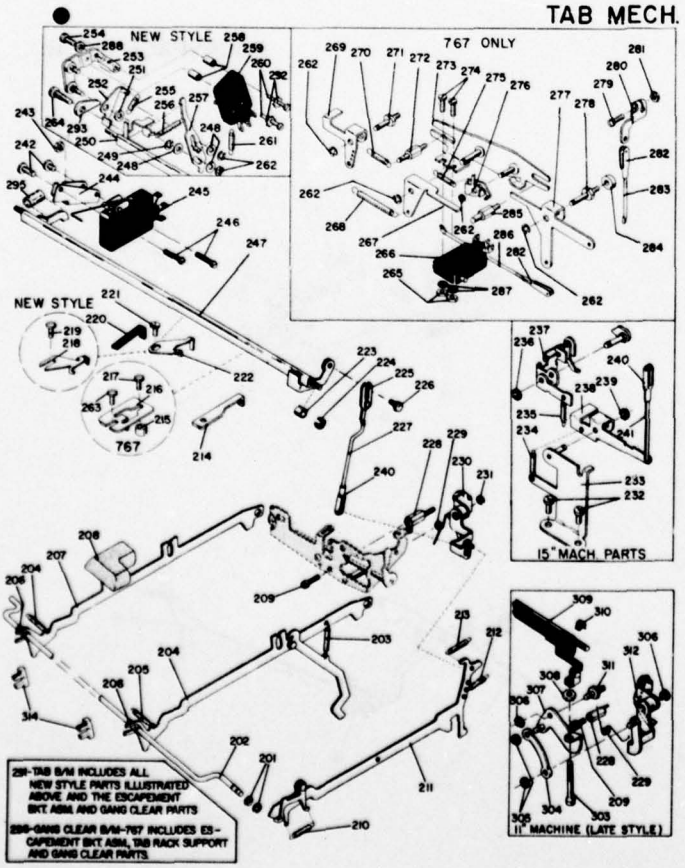


JANUARY 7, 1966

TAB MECH.



TAB MECH.



REF	P/N	SOURCE	DESCRIPTION
101	1127764		GUIDE SET CL LINK
102	38351		SCREW GUIDE MTG
103	1070020		CLEVIS LINK ASM
103	1110529		CLEVIS LINK ASM
	USED ON IMP CONTROL C&R		
104	1123520		KEYLEVER SET CLEAR
104	1128787		KEYLEVER
	USED ON MACHINES W/TAB SET CLEAR LOCKED		
105	1073418		C-CLIP
106	1124875		KEYBUTTON ENGRAVED
106	1133808		KEYBUTTON BLANK
107	*1134950		LINK 11 IN MACHINE
108	*1141146		LINK 15 IN MACHINE
109	*1134952		ARM SET AND CLEAR
110	*1128336		BRACKET SET CLEAR
111	*1124290		SPRING SET CLEAR
111	1144150		SPRING USED ON MACHINES WITHOUT REF 152
112	1164576		SCREW
112	322665		SCREW SABRE
113	*1134829		NUT SET CLEAR BRKT
114	*1123526		BELLCRANK SET CLR
115	* 1928		SCREW SET CLR BRKT
	*REPLACEMENT OF ANY OF THESE PARTS ON EARLY STYLE MECHANISMS REQUIRE REPLACEMENT OF ALL PARTS MARKED WITH AN ASTERISK.		
116	438549		SCREW BRAKE ADJ
117	1117759		SCREW
118	316744		SCREW RACK PLUG
118	257957		SCREW RACK PLG 767
119	1141081		PLATE SPR 11 IN
119	1141080		PLATE SPR 15 IN
120	1164578		SCREW PLATE
121	1134958		SPRING STOP 12 PIT
121	1134959		SPRING STOP 10 PIT
121	1138090		SPRING STOP 767
122	1124076		RACK 10P 11 IN MAC
122	1128029		RACK 10P 15 IN MAC
122	1124110		RACK 12P 11 IN MAC
122	1128038		RACK 12P 15 IN MAC
122	1144752		RACK 10P 767
123	1138402		SUPPORT TAB STOP
124	1164027		SCREW GANG CL FNGR
125	1141270		GANG CLEAR FINGER
126**	1124073		BAR TAB STOP 11 IN
126**	1128028		BAR TAB STOP 15 IN
127	251350		SCREW
128**	338238		SCREW RACK PLATE
129	316744		SCREW RACK PLUG
129	257957		SCREW RACK PLG 767
130	1134961		PLUG TAB RACK
131	219633		C-CLIP
	USED BELOW S/N 4057225		
132	1124082		BUSHING TAB RACK
133	1164576		SCREW
134	1132212		PIN TAB RACK PLATE
135	1132122		C-CLIP TAB RACK
136	1166089		PLATE ALL ABOVE SN 4612333
136	1141210		PLATE TAB RACK ABOVE 4057225
136	1266171		PLATE 11 INCH BETWEEN 4012015 AND 4057225
136	1124081		PLATE 11 INCH BELOW 4012015
137	1141223		RETAINER TAB T BAR
138	1134953		STOP FINAL TAB RK
139**	1124075		STOP FINAL TAB RK
140	1164577		SCREW
141	1145423		BRACKET TAB RK SUP
142	1128538		SHOE TAB RACK SUP
143	265195		SCREW
144	1144907		GUIDE ESC T BAR
145	803278		SCREW
146	1144906		BKT ESC T BAR
147	1134960		STOP TAB
148**	1124074		STOP TAB
	**PARTS USED ON 11 IN MACH BELOW 4009050 15 IN BELOW 4013500		
149	1134961		PLUG TAB RACK
150	1134962		SHAFT 11 INCH MACH
150	1134963		SHAFT 15 INCH MACH
150	1144751		SHAFT 767
151	1134635		NUT BRAKE
152	1127765		BRAKE TAB RACK OLD FOR REPL ONLY
153	1164289		SPRING BRAKE
154	1145422		BKT ASM RACK SUP
155	1073418		C-CLIP
156	1134951		LINK
157	1144848		SHAFT SET CL 767
158	1070020		CLEVIS
159	1144847		LEV INT SET CL 767
160	1117488		LINK
201	1073418		C CLIP
202	1128891		BAIL POWER TAB
203	1071449		SPRING KL PAWL
204	1128859		KEYLEVER TAB RH
205	1073863		SPRING KEYLEVER
206	1073866		BUSHING TAB BAIL
207	1128862		KEYLEVER TAB LH
208	1124890		KEYBUTTON TAB
208	1133312		KEYBUTTON WORKMARK
208	1133809		KEYBUTTON BLANK
209	186923		SCREW STOP MTG
210	1073863		SPRING INTERPOSER
211	1128674		INTERPOSER TAB
212	1134948		SPRING INTERPOSER
213	1073449		SPRING TAB LATCH
214	1135617		SUPPORT TORQUE BAR
215	1145409		COLLAR TAB T BAR
216	1145408		BKT TAB T BAR SUP
217	1164582		SCREW
218	1159202		STOP OVERTHROW
219	1164027		SCREW TAB OVTHROW
220	1134711		SUPPORT TORQUE BAR USED BELOW 4005450
221	1164027		SCREW TAB OVTHROW
222	1127744		STOP OVERTHROW
223	1141223		RETAINER
224	219633		C CLIP
	USED ON 11 INCH BELOW 4057225 AND 15 INCH BELOW 4367458		
225	1128763		PLATE TAB LINK

REF	P/N	SOURCE	DESCRIPTION
226	1124827		SCREW
227	1128759		LINK TAB ACT
228	1128752		STOP TAB BL ECC
229	1128751		SPRING TAB BL
230	1128753		BELLCRANK ASM TAB
231	1073418		C CLIP
232	1164576		SCREW
233	1135312		BRACKET MTG
234	1074242		SPRING INT LEV
235	1116343		SPRING
236	1073418		C CLIP
237	1135340		BL ASM TAB
238	1166301		LEVER TAB INT
239	1073418		C CLIP
240	1070020		CLEVIS TAB ALT
241	1000223		LINK TAB ACTUATING
242	1164580		SCREW
243	37913		NUT TAB SW BKT MTG
244	1135036		BRACKET TAB SWITCH
245	1159045		SWITCH ASM TAB
246	438540		SCREW SW MTG
247	1135241		BAR TAB TORQ 11 IN
247	1128764		11 IN VERY EARLY
247	1135343		BAR TAB TORQ 15 IN
247	1144755		BAR TAB TORQ 767
248	45639		WASHER
249	1159205		C CLIP BOWED
250	1159198		TORQUE BAR 11 INCH
250	1159199		TORQUE BAR 15 INCH
251	20038		SPACER
252	1159204		LEVER TAB SW ACT
253	1159194		BRACKET ASM TAB
254	338238		SCREW
255	1073449		SPRING TAB SW LEV
256	1144928		SPRING TAB TORQUE
256	1090165		SPRING TAB SABRE
257	1159203		LEV TAB SW TRIG
258	1159208		SPACER 15 IN ONLY
259	1159207		SWITCH
260	1159210		SCREW SW MTG 11 IN
260	1159209		SCREW SW MTG 15 IN
261	1072703		SPRING TRIG RES
262	1073418		C CLIP
263	1164027		SCREW
264	1159206		SCREW LH PLATE MTG
264	1159234		SCREW LH PLATE 765
265	47987		NUT SW MTG
266	65266		SWITCH TAB INTERLK
267	1145442		LEVER TAB INLK SW
268	1090435		SPRG TAB INLK LEV
269	1144892		LEVER P TAB ACT
270	115070		SPRING TAB ACT LEV
271	1144891		STUD TAB ACT LEV
272	1144894		STUD MTG BKT
273	1145438		PLATE TAB INTERLK
274	438541		SCREW SW MTG
275	1074242		SPRING T IN LAT LV
276	1145443		LATCH T INT SW LV
277	1144893		LEV P TAB ACT
278	1144891		STUD TAB ACT LEV
279	438549		SCREW TORQUE BAR
280	1144895		ACT TAB TORQUE BAR
281	2114985		NUT TORQUE BAR
282	1070020		CLEVIS
283	1000223		LINK T BAR
284	1144890		SPACER TAB ACT
285	1144889		STUD
286	1070340		LINK TAB ACT
287	358509		LOCKWASHER
288	257985		WASHER
291	1272187		B/M TAB 765
291	1272188		B/M TAB OTHER 15IN
291	1272189		B/M TAB ALL 11 IN
292	358509		LOCKWASHER
293	1018477		RETAINER TORQ 765
294	344239		SPACER
295	100237		SLEEVE TORQ BAR EX
296	1276145		B/M GANG CLEAR 767
303	1159492		SCREW TAB ADJ
304	1159491		LINK POWER TAB
305	219633		RETAINER
306	1073418		RETAINER
307	1159339		BELLCRANK ASM
308	1091057		NUT
309	1159489		TORQUE BAR ASM
310	1141223		CLIP
311	1159494		PIVOT POWER TAB
312	1159483		LATCH ASM
313	1164576		SCREW
314	1141269		SLEEVE LATE STYLE

CODE 916
(6400 PRIMARY PRINTER ONLY)

CODE-516

JANUARY 7, 1966

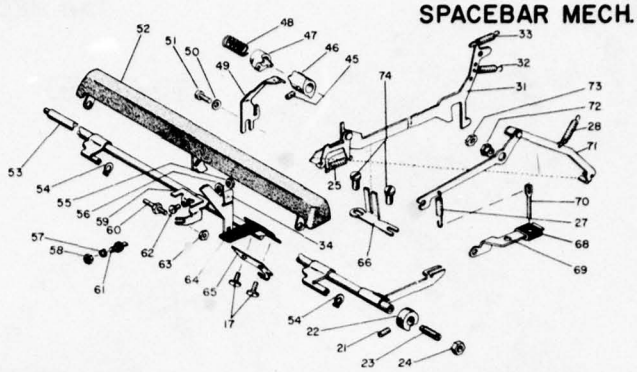
PAGE 18

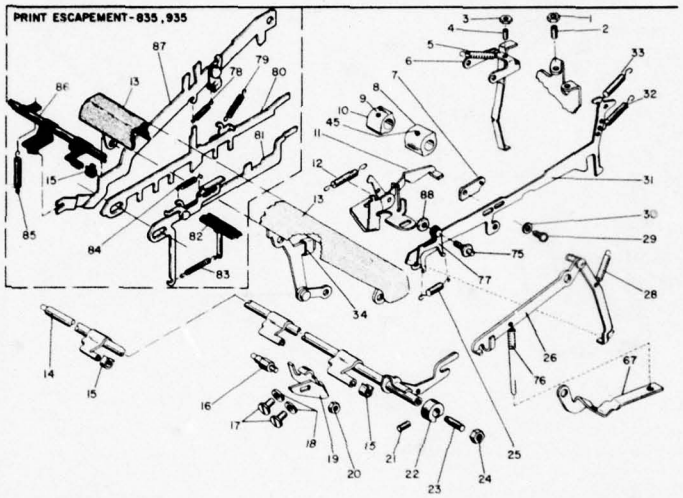
REF	P/N	SOURCE	DESCRIPTION
1	37913		NUT, LATCH SCREW
2	1141071		SCREW,LATCH ADJ
3	37913		NUT,LATCH SCREW
4	1141071		SCREW,LATCH ADJ
5	1100937		SPRING,SB LATCH
6	1128374		LATCH ASM
	ABOVE SN 4615351 11 IN AND 4612100 15 IN		
6	1124476		LATCH ASM, 11 IN
6	1128105		LATCH SB 15 IN
7	□1138805		KEEPER,SB
8	□1138452		CAM ESC
9	□ 257969		SCREW,SB INLK CAM
10	□1145478		CAM SB INTLK
11	□1138454		LEVER ASM,SB INLK
12	□1090343		SPRING,SB LOCKOUT
13	1124885		KEYBUTTON 767
13	□□1266879		KEYBUTTON,SB-GRAY
14	□□1141103		SHAFT ASM,SB
14	1176906		SHAFT ASM 835-935
15	□1128270		CLIP,SB
16	□□1141106		STUD,SB GUIDE
17	1164576		SCREW
18	□□1090970		WASHER,SB SUPPORT
19	□□1141105		SUPPORT, SB
20	□□ 37913		NUT,SB GUIDE
21	257957		SCREW SET
22	1128883		COLLAR,SB LOCKOUT
23	1123987		SCREW, SB SHAFT
24	38051		NUT, SHAFT SCREW
25	1073863		SPRING,INTERPOSER
26	□□1128271		LEVER ASM
	□□USED ON MACHINES ABOVE SN 4083195 AND 4380816		
27	1134708		SPRING SB LEVER
28	123491		SPRING KEYLEVER
29	□1127714		SCREW SB INTKEEPR
30	□1090472		WASHER SB INT SCR
	□USED ABOVE SN 4064000-11 INCH AND SN 4370500-15 INCH		
31	1134865		INTERPOS OLD SB
31	1145362		INTERPOSER SB 767
31	□1135229		INTERPOSER-NEW-SB
32	150047		SPRING INTERPOSER
33	1072703		SPRING LATCH
34	1073866		SLEEVE, SB STEM
45	257969		SCREW,CAM
46	1124538		CAM,ESCAPEMENT
47	1134848		CAM,SB LOCKOUT
48	1134851		SPRING,SB LOCKOUT
49	1134850		GUIDE, CAM
50	355341		WASHER,SCREW
51	38261		SCREW,CAM GUIDE
52	1271552		BUTTON,SB GRAY
53	1123979		SHAFT ASM, SB
	BELOW 4007000 ORDER THE SHAFT ASM BUTTON ASM AND TWO RETAINERS. FOR MACHINES BELOW 4002158,ORDER THE SHAFT ASM,BUTTON ASM,TWO RETAINERS, AND B/M 1271551.		
54	528552		RETAINER
55	**1127763		NUT,STOP SCREW
56	** 257984		WASHER, SCREW
57	6364		WASHER, SB STOP
	**USED ON MACHINES BELOW 4011200		
58	1127722		NUT, SB STOP
59	**1132042		STOP,SPACEBAR
60	1132088		STUD, SB GUIDE
61	1134824		STOP, SB
62	**1164580		SCREW
63	8506		NUT, GUIDE STUD
64	1133671		SPRING,SPACEBAR
64	1123973		SPRING - EARLY
65	1133687		*PLATE, SB SPRING*
66	1134852		GUIDE,INTERPOSER
67	1134977		BRACKET, BAIL
68	1134710		NUT,ADJUST SCREW
69	1124014		BRACKET, REPEAT
	USED ON MACHINES BELOW 4010750		
70	1134709		SCREW,ADJUSTING
71	1123982		LEVER ASM,SPACE
	USED BELOW 4064000 & 4370500		
71	1138469		LEVER ASM, SB
	USED WITH NEW STYLE SB INLK BELOW 4083195, 4704072 & 4380816		
72	1123977		ECCENTRIC, SPACE
73	37913		NUT, SB LEVER
74	1127733		SCREW,INTERLOCK
75	1272940		SCREW
75	1145363		RIVET 767
76	1164086		SPRING SB LEVER
77	1124555		LATCH INTERPOSER
78	1132165		SPRING PAWL
79	1141266		SPRING INTERPOSER
80	1176863		INTERPOSER SP BAR
81	1176920		INTERPOSER SP AUX
82	REFERENCE ONLY SEE REF110 CODE503		
83	123552		SPRING AUX RESTORE
84	1176998		SPRING LINE LOCK
85	1141266		SPRING SB TENSION
86	1176906		SHAFT ASM SP BAR
87	1176914		KEYLEVER SPACE BAR
88	1272939		NUT

CODE 917
(6400 PRIMARY PRINTER ONLY)

CODE-517

SPACEBAR MECH.



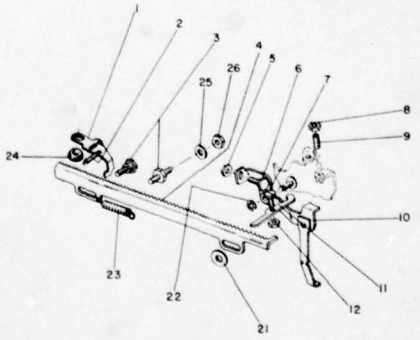


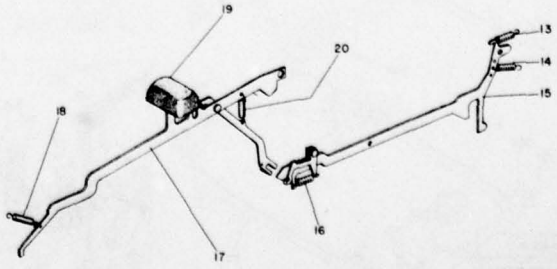
REF	P/N	SOURCE	DESCRIPTION
1	1128202		PAWL BACKSPACE
1	1141536		PAWL BS
	USED WITH GANG CLEAR		
2	1132064		SPRING BS PAWL
3	1124614		STUD BS RACK MTG
3	1144834		STUD 767 - BLACK
3	□1144836		STUD RH 767
4	1144832		RACK 10P 767
4	1124618		RACK BS 10 PITCH 11 INCH MACHINE
4	1128025		RACK BS 10 PITCH 15 INCH MACHINE
4	1124568		RACK BS 12 PITCH 11 INCH MACHINE
4	1128024		RACK BS 12 PITCH 15 INCH MACHINE
5	37913		NUT STUD BELLCRANK
6	1124612		STUD, BS BELLCRANK
7	1124615		STUD BS INTM LEVER
8	37913		NUT SCREW LATCH AD
9	1132098		SCREW BS LATCH ADJ
10	1124489		LATCH ASM BS
10	1159485		LATCH ASM BS
	ABOVE SN 4615351 11 IN AND 4612100 15 IN		
11	1138799		LEVER INTER 10P
11	1138800		LEVER INTER 12P
11	*1124613		LEVER INTER 10P
11	*1132204		LEVER INTER 12P
	*USED BELOW APPROX S/N 4012015		
12	37913		NUT INTM LEVER MTG
13	1072703		SPRING BS LATCH
14	1134948		SPRING OPR INTPR
15	1128674		INTERPOSER BS
16	1073863		SPRING INTPR PAWL
17	1133686		KEYLEVER BS
18	1071687		SPRING BS KEYLEVER
19	1133313		KEYBUTTON 1415
19	1133313		KEYBUTTON 1014
19	1133313		KEYBUTTON 7040-44
19	1133811		KEYBUTTON SABRE
19	1124450		KEYBUTTON STRETCH
19	1133811		KEYBUTTON 1620
19	1124450		KEYBUTTON ET
19	1124450		KEYBUTTON 767
20	1071449		SPRING BS KL PAWL
21	1124616		SPACER BS RACK
22	1073418		RETAINER BS LATCH
23	1091618		SPRING RACK 11 IN
23	58852		SPRING RACK 15 IN
24	1124094		SPACER BS PAWL
25	□1144338		WASHER 767
26	□ 47987		NUT 767
	□USED WITH STUD 1144836		

CODE 918
(6400 PRIMARY PRINTER ONLY)

CODE-518

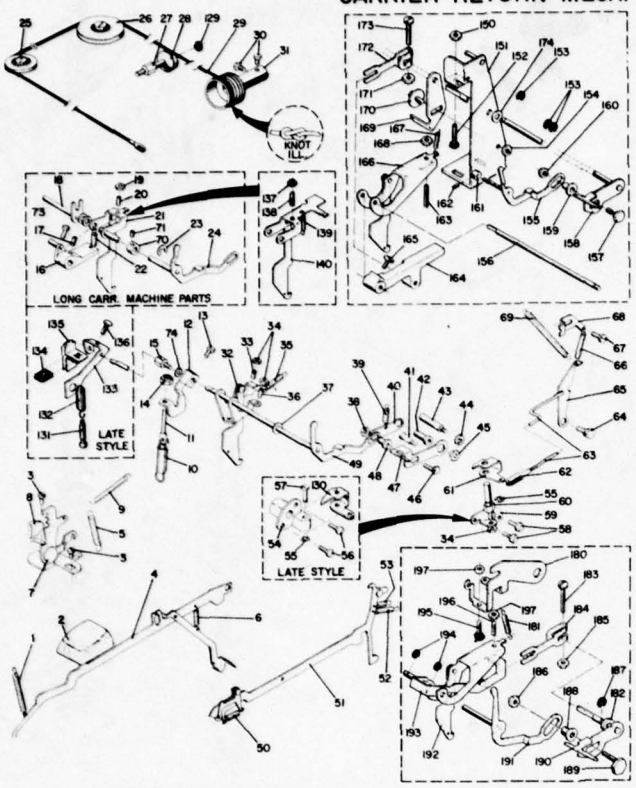
BACKSPACE MECH.



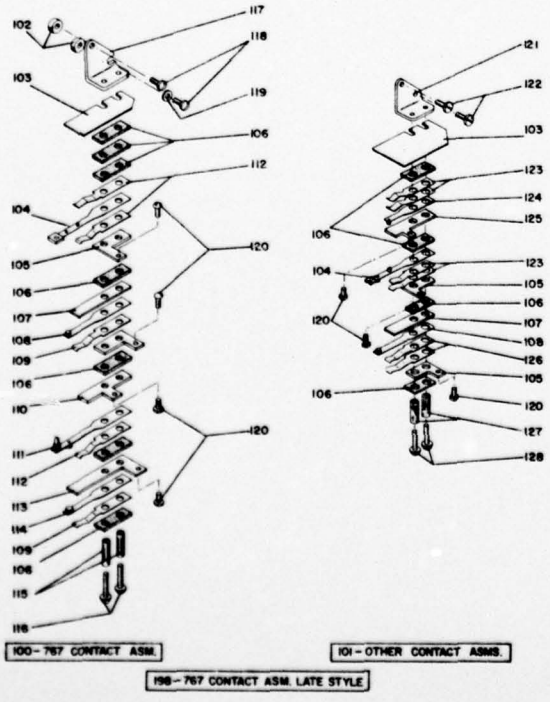


JANUARY 7, 1966

CARRIER RETURN MECH.



CARRIER RETURN MECH.



REF	P/N	SOURCE	DESCRIPTION
1	123491		SPRING KEYLEVER
2	1133314		KEYBTN 1014 & 1415
2	1124870		KEYBTN ALL OTHERS
3	1164576		SCREW ARM ASM MTG
3	322065		SCREW RH LONG
4	1133681		KEYLEVER
4	1159362		KEYLEVER 775
5	43373		SPRING CR SHOE
6	1071449		SPRING CR K/L PAWL
7	1132003		ARM ASM CR ACTUAT
7	1144922		ARM ASM CR ACT 767
	FOR MACHINES BELOW 4600120 ALSO ORDER PN 1128338 & PN 43373		
8	1128338		SHOE, CARR RETURN
8	1124478		SHOE, CARR RETURN
	FOR MACHINES BELOW 4600120		
9	1128325		SPRING ACTUAT ARM
9	1117589		SPRING SHORT
	USED ON MACHINES WITH OLD CR ACT ARM - HOOKED BETWEEN ACTUATING ARM AND ESCAPMENT BACK PLATE. SPR REF 39 SHOULD BE REMOVED		
10	1132007		SPRING CR ACTUAT
11	1132000		STUD ACT ARM SPR
12	1133610		HUB CLUTCH ARM
13	1124775		SCREW CR HUB
14	1138462		NUT CR SHOE ADJSTG
15	1133549		SCREW CR CI ARM
16	1128125		LEVER ASM CR
17	338238		SCREW CR LEVER MTG
18	1128122		LEVER ASM CR LATCH
19	37913		NUT CR LATCH SCREW
20	1159298		SCREW LATCH ADJ
20	1159286		REF 138
	USED ABOVE SN 4608386		
21	1128103		ARM ASM CR LATCH
21	1128103		ARM ASM 767
22	1128008		SPRING CR LEVER
23	1073418		CLIP C LATCH ARM
24	1128099		ARM A CR LATCH ACT
24	1144849		ARM ASM CR LAT 767
25	1124638		PULLEY LH FRONT
26	1124567		PULLEY LH REAR
27	1124453		STUD REAR IDLER
27	1144911		STUD REAR IDLE 767
28	1124628		PULLEY REAR IDLER
29	1166414		CORD CR 11 IN
29	1166415		CORD CR 15 IN
29	1144852		CORD CR 767
30	1128352		SCREW CR CORD DRUM
30	1145479		SCREW DRUM 767
31	1124463		DRUM CR CORD
31	1144762		DRUM CR 767
32	1124472		ARM ASM CR LATCH
33	1132098		SCREW CR LATCH ADJ
34	37913		NUT ADJ
35	123491		SPRING CR LAT ARM
36	1132098		SCREW CR ADJ
37	1090394		WASHER CR ACT ARM
38	37913		NUT CLUTCH ECC
39	FOR REFERENCE ONLY		
40	1138110		LINK CR LATCH
	ON MACHINES WITH OLD STYLE CR ACT ARM REMOVE REF 39 AND INSTALL REF 9		
41	*1124766		STUD MULT LEV
41	1135676		STUD 765
42	*1124767		BUSHING MULT LEV
43	1134957		STUD PRESSED IN THE SIDE FRAME
44	1092125		C CLIP
45	* 257186		NUT MUTL LEV
	*USED ON MACHINES BELOW 4012015		
45	1135677		NUT 765
46	1124610		STUD LATCH ECC
47	1128168		LATCH CR CLUTCH
47	1124608		LATCH CR CLUTCH
	BELOW SN 4012015		
48	1128169		SPACER CR CLUTCH
48	1124609		SPACER 11 INCH
	BELOW SN 4012015		
49	1144849		ARM CR LATCH 767
49	1133608		ARM CR LATCH ACT
	FOR MACHINES BELOW 4001844 ALSO ORDER 1133609 ARM 1133610 HUB 1133549 SCREW AND 1124775 SCREW		
50	1073863		SPRING INTPOS PAWL
51	1128673		INTERPOSER CR
52	1131948		SPRING CR INTPOS
52	1134884		SPRING 767
53	1072703		SPRING CR LATCH
54	1141230		BUSHING RH 11 IN
54	1141231		BUSHING RH OTHER
55	264641		C CLIP
56	1164582		SCREW RH BUSHING
57	1141228		STUD CLUTCH UNLAT
58	1164576		SCREW BRKT MTG
59	1128167		BKT CR UNLATCHING
60	1123627		STUD CR UNLATCHING
61	1123628		BELLCRANK CR UNLAT
62	1070020		CLEVIS
63	1124600		LINK CR UNLATCHING
63	1164171		LINK CR UNLATCH
	USED ABOVE SN 4607315		
64	1123629		STUD CR KEEPER
65	1123631		KEEPER CR LATCH
66	150735		SPRING CR KEEPER
67	322065		SCREW LOCK 11 IN
67	1128113		SCREW LOCK 15 IN
68	1127737		LOCK TAB RACK BUSH
69	1115017		SPRING COVER INTLK
70	1144937		COLLAR 767
71	257957		SCREW COLLAR 767
72	45638		SPACER 767
73	38263		SCREW 767
74	56722		LOCKWASHER
100	1144859		CONTACT ASM 767
101	1128748		CONTACT ASM
101	1159589		CONTACT ASM
	USED WITH TILT UP COVERS		
101	1076948		CONT ASM 835-935
102	1123590		SPACER
103	1108350		SHIELD CONTACT
104	1128744		STRAP ASM O/S
104	1176949		STRAP 835 935
105	339109		TERMINAL CONTACT
106	37435		INSULATOR
107	326119		SUPPORT CONT STRAP
108	1128745		STRAP ASM N/O
109	339113		SP CONT BACKUP

REF	P/N	SOURCE	DESCRIPTION
110	339108		TERMINAL CONTACT
111	1127273		STRAP ASM O/S
112	316457		SP CONTACT BACKUP
113	339107		TERMINAL CONTACT
114	326067		STRAP ASM N/O
115	100349		INSULATOR
116	173209		SCREW CONT MTG
117	1128749		CONT BRACKET
117	1159558		CONTACT BKT 767
	ABOVE SN 4610360		
118	338238		SCREW CONT ASM MTG
119	45639		WASHER
120	118418		SCREW TERMINAL
121	1128749		BKT CONT ASM MTG
122	1164582		SCREW CONT ASM MTG
123	1135466		SPRING BACKUP
124	1128746		STRAP ASM N/C
125	1128743		TERMINAL CONTACT
126	1135467		SPRING BACKUP
127	100229		INSULATOR
128	173205		SCREW CONT MTG
129	1073418		C-CLIP
130	1128397		BELLCRANK CLU UNLA
131	1141173		STUD CR ARM
132	1141172		SPRING CR ARM
133	1141245		ARM CR CLUTCH
134	1164799		BLOCK RUBBER
135	1141290		CLIP CR ARM
136	1124775		SCREW CR HUB
137	37913		NUT LATCH ADJ
138	1159286		SCREW LATCH ADJ
139	1100937		SPRING CR LATCH
140	1164105		ARM ASM CR LATCH
150	37913		NUT
151	1159321		BRACKET ASM
152	1159286		SCREW
153	1092125		RETAINER
154	REF ONLY SEE INDEX MECH		
155	1159327		ARM ASM CR LAT ACT
156	1159334		PIN LH OPER PIVOT
157	1124610		STUD LATCH ECC
158	1159818		LATCH ASM
159	1128169		SPACER
160	37913		NUT
161	1159336		COLLAR
162	257957		SCREW SET
163	1141072		SCREW
164	1166212		LEVER ASM
165	338238		SCREW LEVER ASM
166	1166214		LATCH ASM
167	1100937		SPRING LATCH
168	37913		NUT
169	REF ONLY SEE INDEX MECH		
170	REF ONLY SEE INDEX MECH		
171	38051		NUT
172	1159335		ARM INTERMEDIATE
173	236550		SCREW
174	1090336		WASHER
180	1159493		BRACKET
181	1100937		SPRING
182	1090336		SPACER
183	322065		SCREW
184	1159335		ARM INTER LATCH
185	38051		NUT
186	37913		NUT
187	1092125		RETAINER
188	1128169		SPACER
189	1124610		STUD LATCH ECC
190	1159374		LATCH ARM
191	1159372		ARM ASM CR LAT ACT
192	1166214		LATCH ASM
193	1159479		LEVER CR RETURN
194	1092125		RETAINER
195	1159286		SCREW ADJ
196	1141072		SCREW ADJ
197	37913		NUT
198	1145495		767 CONT ASM LATE
	SEE REF 81 CODE 920 FOR IND PARTS		

CODE 919
(6400 PRIMARY PRINTER ONLY)

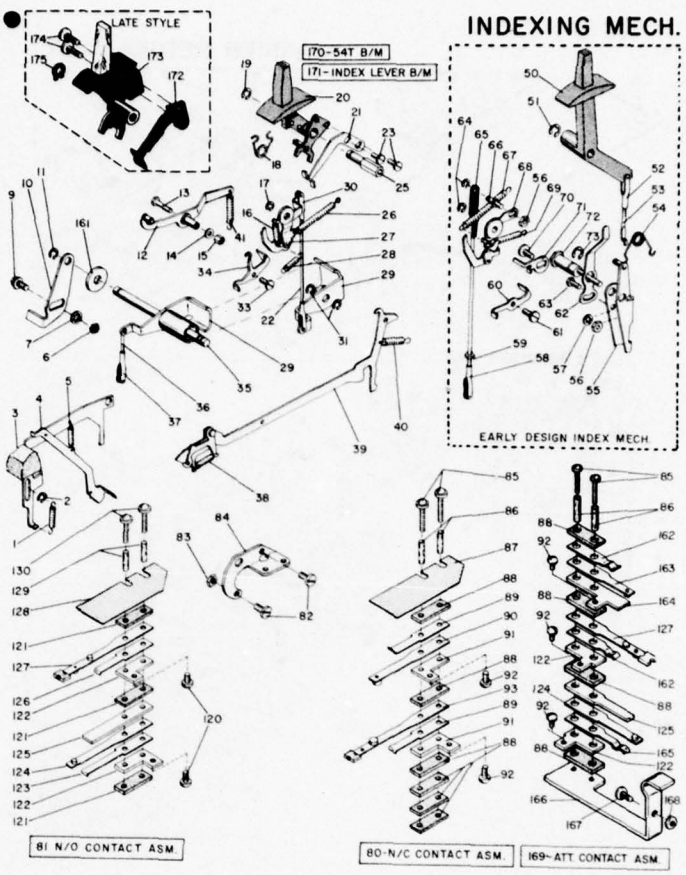
CODE-519

PAGE 20

REF	P/N	SOURCE	DESCRIPTION
1	177939		SPRING INDEX KL
2	1073418		C-CLIP
3	1164859		KEY BUT ATT 935
3	1133315		KEY BUT 1014 1415
3	1133807		KEY BUT STRETCH, SABRE
3	1141116		KEY BUT 1620
3	1124850		KEY BUT ET
4	1123984		KEYLEVER INDEX
4	1159193		KEYLEVER INDEX
	USED ABOVE SN 4605252		
5	1071449		SPRING KL PAWL
6	257187		NUT 15 INCH MACH
7	1090622		WASHER 15 IN MACH
9	1128411		SCREW SEMS 11 IN
9	340191		SCREW 15 IN MACH
10	1135167		LEVER
10	1141558		LEVER 24T
11	1092125		C-CLIP 15 IN MACH
12	1128975		DETENT 36T
	ALSO ORDER REF 13 AND 14		
12	1138122		DETENT ASM 27T
	ALSO ORDER REF 13 AND 14		
12	1141561		DETENT ASM 24T
	ALSO ORDER REF 13 AND 14		
13	1128302		SCREW DETENT ASM
	ALSO ORDER REF 12 AND 14		
14	257984		WASHER DETENT
	ALSO ORDER REF 12 AND 13		
14	1127741		SPACER DET PIN FD
15	1127763		NUT DETENT STUD
16	1107795		SPRING INDEX PAWL
17	264641		C-CLIP
18	1124396		SPRING IND SEL LEV
19	1092125		C-CLIP
20	1135456		LEVER INDEX SEL
20	1135265		LVR IND ALL METAL
20	1166071		LEVER IND SEL 54T
20	1128483		LEVER IND SEL 835
21	1128076		LEVER CAM 27T 36T
21	1141559		LEVER CAM 24T
22	1134956		LINK INDEX 11 INCH
22	1128083		LINK INDEX 15 INCH
23	1164576		SCREW
25	1128084		STUD IND SEL LEV
	USED ON ALL 11 IN AND 15 IN MACHINES ABOVE 4012015		
26	1133667		SPRING INDEX
27	1128018		CARRIER IND PAWL
28	1133668		SPRING INDEX PAWL
29	1166186		LEVER INDEX 15 IN
30	1070020		CLEVIS
30	*1164127		CLEVIS
	*USE ON MACHINES ABOVE SN 4602500		
31	1092125		C-CLIP 15 IN MACH
33	1164582		SCREW PLATEN STOP
34	1128017		STOP PLATEN OVERTH
35	1128081		SHAFT 15 IN MACH
36	1128079		LINK 15 IN MACHINE
37	1127727		CLEVIS
37	1164127		CLEVIS LOCKING
38	1073863		SPRING INT PAWL
39	1128674		INTERPOSER INDEX
40	1134948		SPRING INTERPOSER
40	1134884		SPRING 767
	EARLY STYLE INDEX		
41	1133663		SPRING DETENT
50	1124764		LEVER INDEX SELECT
51	1092125		C-CLIP
52	1070020		CLEVIS
53	1014536		LINK INDEX SELECT
54	1132173		SPRING INDEX SELEC
55	1123532		LEVER INDEX MULT
56	38214		NUT LEVER STOP SCR
57	62031		WASHER
58	1127727		CLEVIS
58	1164127		CLEVIS LOCKING
59	1127728		NUT
60	1132161		STOP PLTN OVERTHRO
61	1117759		SCREW PLATEN STOP
62	1132162		STOP INDEX MUL LEV
63	1164582		SCREW LEVER STOP
64	264641		C-CLIP
65	1124772		LINK PWL CARRIER
66	1132158		STUD INDEX LINK
67	1132164		SPRING IND PWL CAR
68	1124756		CARRIER ASM IND PL
69	1115017		SPRING INDEX PAWL
70	1117759		SCREW UP STOP
71	1124762		STOP UPPER INDEX
72	1124766		STUD CONTROL LEVER
73	1092125		C-CLIP
	CONTACTS		
80	1135002		N/C CONTACT ASM
81	1135212		N/O CONTACT ASM
82	1164579		SCREW
83	38051		NUT
84	1135001		BRACKET CONTACT MT
85	173205		SCREW CONT MTG
86	100229		INSULATION SCREW
87	1108350		SHIELD CONTACT
88	37435		INSULATION CONTACT
89	1135466		SPRING CONT BACKUP
90	1135474		CONTACT STRAP
91	339109		TERMINAL CONTACT
92	118418		SCREW TERMINAL
93	1135479		CONTACT STRAP
120	118418		SCREW TERMINAL
121	37435		INSULATOR CONTACT
122	339109		TERMINAL CONTACT
123	1135467		SPRING CONT BACKUP
124	1128745		CONTACT STRAP N/O
125	326119		SUPPORT CONT STRAP
126	1135466		SPRING CONT BACKUP
126	1135467		SPRING CONT 767
127	1128744		CONTACT OP STRAP
128	1108350		SHIELD CONTACT
129	114045		INSULATION SCREW
130	173202		SCREW CONT MTG
161	1100668		WASHER
162	1135466		SPRING CONT BACKUP
163	1128746		CONTACT STRAP
164	118418		TERMINAL CONTACT
165	1135467		SPRING CONT BACKUP
166	1176514		BRACKET ATT MTG
167	1164579		SCREW ATT MTG
168	38051		NUT
169	1176913		CONTACT ASM 935
170	1271988		B/M 54T
171	1272719		B/M INDEX LEVER AND OP SHAFT SUP
172	1128477		LEVER CAM 27T 36T
173	1135466		LEVER INDEX SEL
174	1141776		SCREW
175	1115633		RETAINER

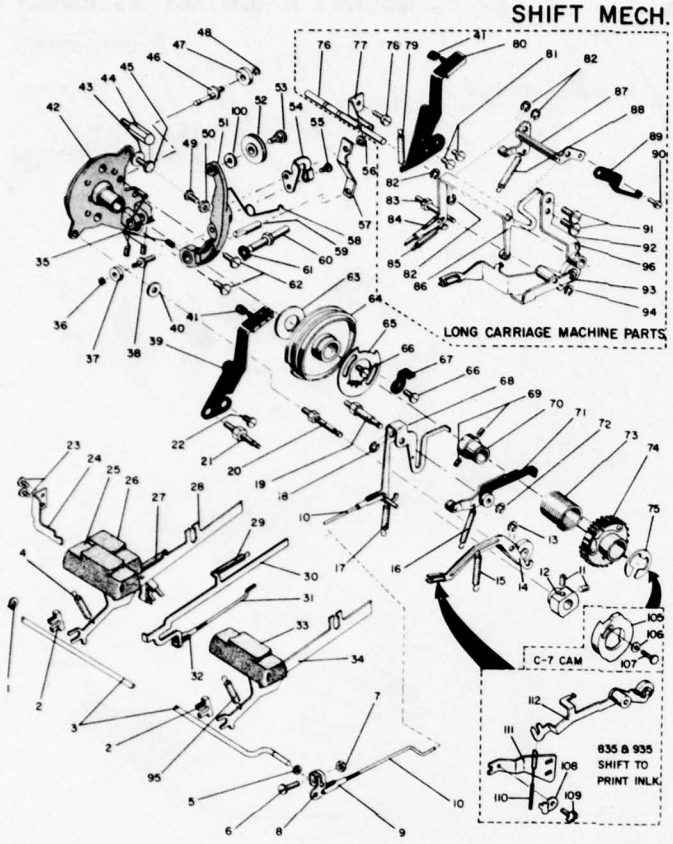
CODE 920
(6400 PRIMARY PRINTER ONLY)

CODE-520

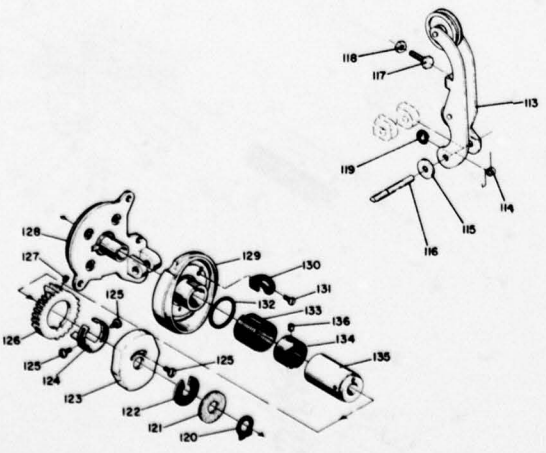


JANUARY 7, 1966

SHIFT MECH.



SHIFT MECH.



REF	P/N	SOURCE	DESCRIPTION
1	1118361		RETAINER BAIL
2	1141269		SLEEVE, SHIFT KYL
3	1132235		BAIL, SHIFT
4	1072703		SPRING,KEYLEVER LH
5	1138455		WASHER, SHIFT BAIL
6	1928		SCREW, SHIFT BCRK
7	1134829		NUT, SHIFT BAL BCK
8	1124285		BELLCRANK SHIFT BL
9	1070020		CLEVIS SHIFT REL L
10	1128935		LINK ARM SHIFT REL
11	1100523		SCREW SHIFT INTERL
12	1124284		CAM SHIFT INTERLK
13	1073418		CLIP C SH DETENT
14	*1133596		DETENT SHIFT CAM
15	1124722		SPRING SHIFT DET
16	1090162		SPRING SH INTERLK
17	1072703		SPRING SH RELEASE
18	264641		RETAINER SH REL A
19	1141648		STUD SHIFT REL
	USED ON IMP CONTROL C&R		
19	1132286		STUD SHIFT REL
19	1144795		STUD, 767
20	*1124697		STUD SH DETENT ARM
	*BELOW MACHINE SER #4002000 RE-PLACEMENT OF PART 1124697 OR 1133596 REQUIRES REPLACING BOTH		
21	1133501		STUD SH DET SPRING
22	1164576		SCREW SHIFT BRAKE
23	1164582		SCREW SH LK BRACKT
24	1124010		BRACKET SHIFT LOCK
25	1127936		KEYBUTTON LH 1014
25	1133037		KEYBUTTON LH SABRE
25	1132259		KEYBUTTON LH OTHER
26	1133810		KEYBUTTON LK 1014
26	1133810		KEYBUTTON LK SABRE
26	1132266		KEYBUTTON LK OTHER
27	1074242		SPRING SHIFT LOCK
28	1133685		KEYLEVER 1014SABRE
28	1128871		KEYLEVER ALL OTHER
29	1107794		SPRING SH LK INTPR
30	1128893		INTERPOSER SH UNLK
31	1135604		LINK LOCKOUT
32	1070020		CLEVIS LKOUT LINK
33	1127930		KEYBUTTON RH 1014
33	1133038		KEYBUTTON RH SABRE
33	1132252		KEYBUTTON RH OTHER
34	1133672		KEYLEVER RH SHIFT
35	257969		SCREW SHF ARM PIV
36	251989		RETAINER CAM ROLL
37	1124259		ROLLER SHIFT ARM
38	1159109		SHAFT ROLLER
39	1132029		BRAKE SHIFT CAM
40	22066		WASHER SH DET STUD
41	1124773		DAMPER, BRAKE ARM
42	1135039		PLATE, SHIFT ARM
42	1159969		PLATE 11 IN PERMIS MAKE CONTACTS
43	1090050		SPACER STOP SCREW
44	1128970		STUD ARM STD SABRE
45	1124775		SCREW SHIFT STOP
46	1123807		SHAFT ECCENTRIC
47	1124292		ROLLER CAM BACKUP
48	1073418		CLIP C ROLLER ECC
49	1141215		SCREW SHIFT ARM
50	1141030		NUT SCREW SHIFT
51	1124261		ARM SHIFT
52	1124267		PULLEY RH ROTATE
52	1144979		PULLEY, 767
53	1124268		SCREW RH ROTATE PU
53	1164576		SCREW 767
54	1128971		TAB SHIFT ARM
55	15887		SCREW TAB SHIFT A
56	38051		NUT ROLLER SHAFT
57	1128785		BRACE SHIFT ARM
58	1128471		SPRING SHIFT ARM
59	1124266		PIN PIVOT SH ARM
60	1138463		PIN, SHIFT ARM
	USED ON MACHINES BELOW SN 4005000		
61	1115633		RETAINER
62	1164576		SCREW, MTG PLATE
63	1124819		WASHER SHIFT CAM
	USED ON MACHINES BETWEEN SER# 4005325 AND 4014850		
64	1135639		CAM SHIFT
65	1124273		PLATE SH CLU SPG R
66	1164584		SCREW SH BACKSTOP
67	1123810		STOP SHIFT CAM
68	1128932		ARM SHIFT RELEASE
68	1144790		ARM REL 767
69	257969		SCREW SET SH ARBOR
70	1124271		ARBOR SHIFT CLUTCH
71	1124276		ARM ASM INTERLOCK
72	1073418		CLIP SHIFT INTL
73	1132287		SPRING,SHIFT CLUT
74	1132123		RATCHET 11 INCH MA
74	1159409		RATCHET 15 INCH MA
75	219743		CLIP C SH RATCHET
76	1128190		SHAFT REL 15 INCH
77	1128195		BRACKET SHIFT SPR
78	38351		SCREW, BRACKET
79	1124722		SPRING, DETENT
80	1128199		BRAKE SHET 15 INCH
81	1164576		SCREW, BRAKE MTG
82	264641		CLIP C SH REL 15IN
83	1124697		STUD DET 15 INCH
84	1135304		LINK SHIFT RELEASE
84	1128935		LINK SHIFT RELEASE
	USED ON MACH ABOVE SN 4615040		
85	1072703		SPRING SHIFT REL
86	1135320		ARM SHIFT REL 15IN
86	1144790		ARM, 767
87	1128192		ARM ASM 15 INCH
87	1144880		ARM, 767
88	1090162		SPRING SHIFT INTLK
89	1128193		ARM SH INLK SPR 15
90	358174		SCREW SHIFT INTL
90	1141853		SCREW 767
90	1138353		SCREW, EARL;
	USED WITH WASHER PN 1090630		
91	1164576		SCREW BRACKT 15 IN
92	1128189		BRACKET SHIFT SUPP
93	1159782		DETENT SHIFT CAM
94	1073418		CLIP C DETENT ARM
95	1073863		SPRING, RH KL
96	257957		SCREW REL SHAFT

REF	P/N	SOURCE	DESCRIPTION
100	1145451		SPACER 767
105	1176842		CAM C-7
106	257985		WASHER CAM SCREW
107	1159262		SCREW C-7 CAM
108	1176884		CLAMP CABLE
109	1164578		SCREW CABLE CLAMP
110	1176882		CABLE CC SH INPUT
111	1176885		BRACKET, CLAMP MTG
112	1176872		ARM, PRINT INLK
113	□1128355		SHIFT ARM 765-1014
113	□1159799		SHIFT ARM 731-735
113	□1145519		SHIFT ARM 767
113	□1166003		SHIFT ARM 775
114	□1128303		SPRING
115	□1090254		WASHER
116	□1141992		PIN PIVOT
117	□1128356		SCREW STOP
118	38051		NUT SCREW LOCKING
119	1092125		RETAINER
	USED ABOVE SN 4619427		
120	1133746		RETAINER
121	1166557		WASHER THRUST
122	1166370		WASHER C7 MTG
	USED WITH REF 123		
123	1176990		CAM C-7 835
124	1166380		STOP SHIFT RATCHET
125	1166363		SCREW ADJ
126	1166384		RATCHET 11 IN
126	1166385		RATCHET 15 IN
127	1124836		SCREW RATCHET
128	1166368		PLATE SHIFT 15 IN
128	1166371		PLATE SHIFT 11 IN
129	1166375		CAM SHIFT
130	1123810		OVERTHROW STOP
131	1164584		SCREW STOP
132	1160256		O-RING
133	1166381		SPRING SHIFT CLU
134	1166362		ARBOR SHIFT CLUTCH
135	1166369		SLEEVE SHIFT ASM
136	257969		SCREW SHIFT ARBOR

CODE 922
(6400 PRIMARY PRINTER ONLY)

CODE-522

PAGE 22

REF	P/N	SOURCE	DESCRIPTION
1	1135425		SHIELD CONTACT
1	1159542		SHIELD CONTACT
	USED ABOVE SN 4610399		
2	37435		INSULATOR PLATE
3	339109		TERMINAL CONT SPR
4	118418		SCREW TERMINAL
5	1135467		SPRING CONT BACKUP
6	1128745		CONTACT SHIFT N/O
7	326119		SUPPORT CONT STRAP
8	1135466		SPRING CONT BACKUP
8	1135467		SPRING 767
9	1128744		CONTACT OPER STRAP
10	1128743		TERMINAL CONTACT
11	1128746		CONTACT SHIFT N/C
12	104278		INSULATOR SCREW
13	104676		SCREW CONT MTG
14	1262780		CONTACT ASM SHIFT
14	1159506		CONTACT ASM 775
	ORDER COMPLETE ASM WHEN REPL PART NECESSARY		
15	1262776		CONT TRANS SABRE
15	1262777		CONT TRANS OTHERS
16	1128947		CONTACT N/O LEFT
17	1128948		CONTACT O/S
18	1128946		CONTACT N/O RIGHT
19	173215		SCREW CONT SABRE
19	173207		SCREW CONT OTHERS
20	1262778		CONTACT FB SABRE
20	1262779		CONTACT FB OTHERS
21	27460		INSULATOR THICK
22	105052		INSULATOR SABRE
22	104278		INSULATOR OTHERS
23	173205		SCREW CONT SABRE
23	173213		SCREW CONT OTHERS
24	165556		SCREW SET CONT LEV
25	*1128954		FOLLOWER SHIFT CAM
26	264641		C-CLIP FOLLOW ARM
27	*1128952		BRACKET SHIFT CONT
28	1164576		SCREW BRACKET MTG
29	*1166165		LEVER SHIFT CONT
	*BELOW SN 4619427 REPLACEMENT OF ANY PART WILL REQUIRE REPLACEMENT OF ALL THREE		
30	1090162		SPRING FOLLOWER
31	1164576		SCREW BRACKET
32	1128962		CORE UC
33	1128959		CORE LC
34	1135134		COIL LC SHIFT 48V
34	1266894		COIL LC SHIFT 24V
35	1164578		SCREW
36	1164578		SCREW
37	123552		SPRING HINGE PLATE
38	1128967		PLATE UC&LC HINGE
39	1128969		ARMATURE LC
40	1072126		SPRING ARM LATCH
41	1128965		STOP ARMATURE
42	1128968		ARMATURE UC
43	1128966		BACKSTOP ARM UC
44	1127785		SCREW
45	1128964		COIL UC SHIFT 48V
45	1266893		COIL UC SHIFT 24V
46	1117759		SCREW
47	302131		INSULATOR TERM BLK
48	302090		TERMINAL BLOCK
49	438549		SCREW TERM BLK
50	1128958		BRACKET
	CONTACT ASSEMBLY SHIFT		
53	1128939		ET AND STRETCH
53	1128847		1415 7040 7044
53	1128938		SABRE
53	1143470		767 CONTACT ASM
53	1135696		765 CONTACT ASM
53	1159721		870
	MAGNET ASSEMBLY SHIFT		
54	1272125		24 VOLT
54	1135302		ALL
54	1145388		767 MAGNET ASM
55	210921		DIODE 765
55	1160777		DIODE, SINGLE
	USED ALSO 767 PINS 2T08 AND 2T04		
55	1135573		DIODE 767 PINS 1 TO 6 AND 3 TO 7
60	1142377		STUD SHIELD
61	1176843		CONT C-7 835 935
62	1159112		INSULATOR C-7
63	1128832		TERMINAL CONT SPR
64	1073215		SCREW 835 935
65	1135621		BRACKET CONTACT
66	339107		TERMINAL CONT SPR
67	1176844		CONTACT OPER STRAP
70	35534		WASHER
71	1176975		COIL SH UNLOCK
72	198363		SCREW TERM BLOCK
73	317767		TERMINAL BLOCK
74	317766		INSULATOR
75	1176901		BRACKET SH UNLOCK
76	105052		INSULATOR C-7
77	1176900		MAG ASM 835-935

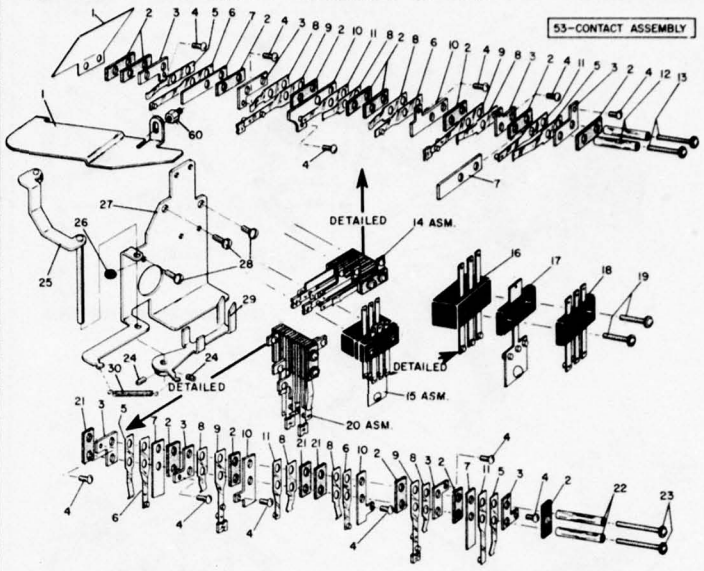
REF	P/N	SOURCE	DESCRIPTION

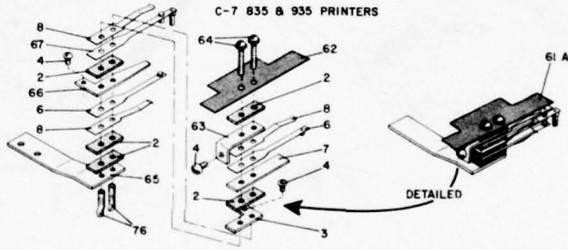
CODE 923
(6400 PRIMARY PRINTER ONLY)

CODE-523

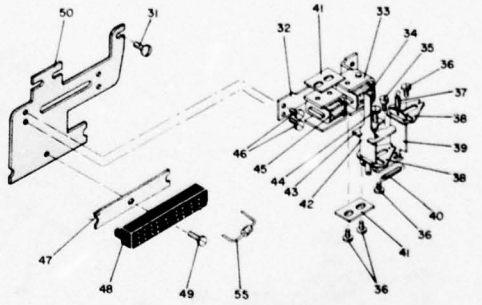
JANUARY 7, 1966

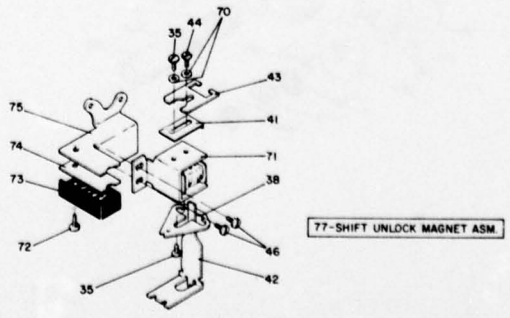
SHIFT MAGNET & CONTACT ASSEMBLY



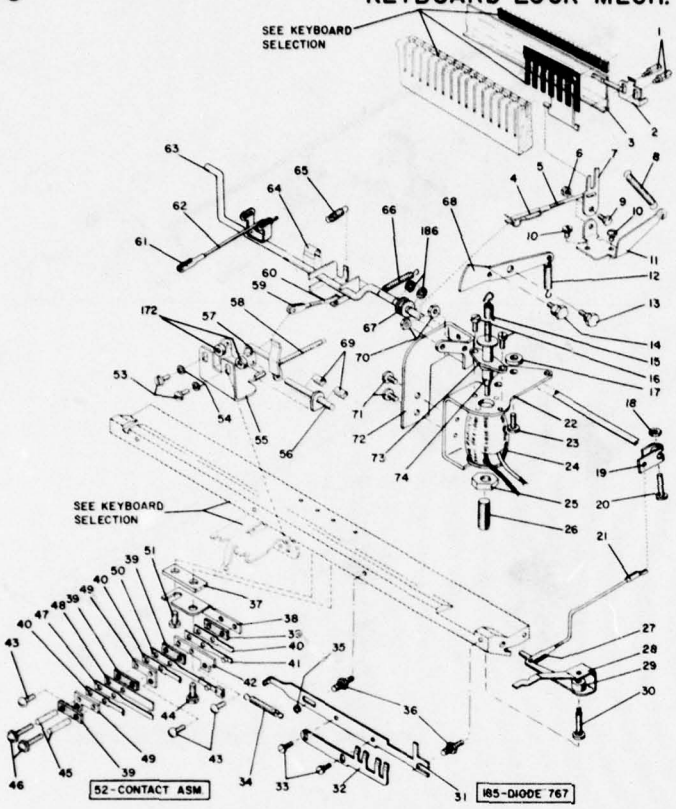


SHIFT MAGNETS & CONTACT ASSEMBLY

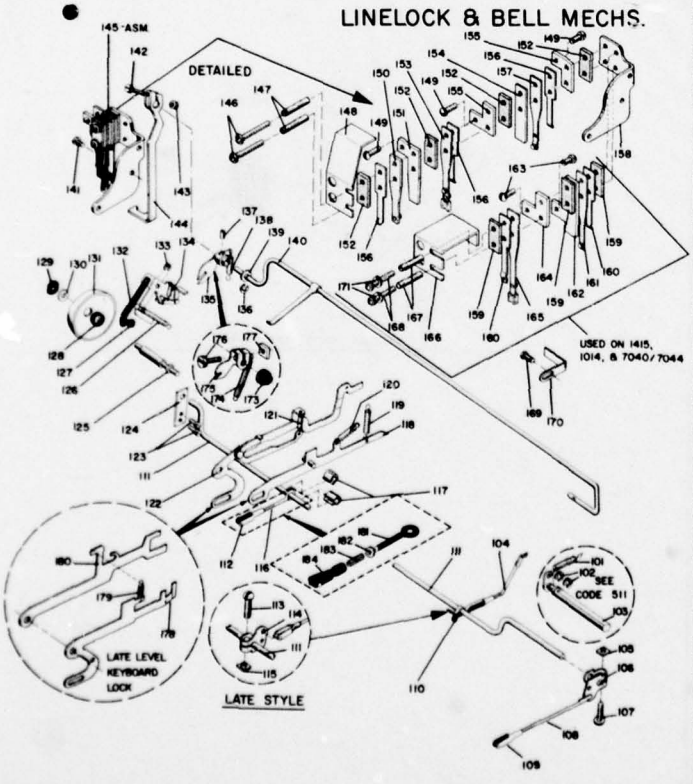




KEYBOARD LOCK MECH.



LINELOCK & BELL MECHS.



REF	P/N	SOURCE	DESCRIPTION
1	1135584		SCREW, SUPPORT MTG
2	1135497		SUPPORT, INTPR LK
3	1135505		LOCK, INTERPOSER
4	1123754		CLEVIS, INTPR LK L
5	1135713		LINK, INTPOSER LK
6	37913		NUT, KB LK LEV MTG
7	1135496		LEVER, KB LOCK
8	1090175		SPRING, INTLK RET
9	1135130		STUD, KB LOCK LEV
10	1164582		SCREW KB LVR MTG
11	1135498		BRACKET, LEVER LK
12	1124206		SPRG,LOCKOUT LEVER
	ENERGIZE TO UNLOCK		
12	1090404		SPRING L/O LEVER
	ENERGIZE TO LOCK		
13	1128649		SCREW,L/O LEV PIV
14	1128647		SCREW,L/O LEV ECC
15	1128648		SPRING, LINK
16	1110668		SCREW GUIDE MTG
17	1128828		SPACER, SOL ASM
18	37913		NUT, CRANK MTG
19	1128928		CRANK, L/O BAIL
20	438549		SCREW, CRANK MTG
21	1128890		LINK, L/O BELLCRNK
22	1135235		YOKE, K/B LOCK SOL
23	35739		SCREW, YOKE MTG
24	1135089		COIL KB LOCK 48V
24	1266892		COIL KB LOCK 24V
25	1128644		NUT, SOL CORE ADJ
26	343752		CORE, SOLENOID
27	1070020		CLEVIS, L/O LINK
28	1128877		BELLCRANK, LOCKOUT
28	1144933		BELLCRANK 767
29	1128885		SPACER, BELLCRANK
30	1128879		SCREW B/C MTG
31	1128874		COMB ASM, LOCKOUT
31	1176848		COMB 835-935
32	1176847		COMB 835-935
32	1135007		COMB ADJ 1014 1415
32	1128892		COMB, ADJ OTHERS
33	358174		SCREW, COMB ADJ
34	1090404		SPRING, L/O COMB
35	1073418		CLIP C L/O COMB
36	1128880		SCREW, L/O COMB MT
37	1128882		SPACER, K/B CONT
38	1128897		BRACKET, CONT MTG
39	37435		INSULATOR PLATE
40	1135466		SPRING BACKUP
41	1128746		STRAP CONTACT N/C
42	1128743		TERMINAL CONT
43	118418		SCREW, TERMINAL
44	236550		SCREW BKT MTG
45	100229		INSULATOR SCREW
46	173205		SCREW, CONT ASM
47	1128745		STRAP, CONTACT N/O
48	326119		SUPPORT CONT STRAP
49	339109		TERMINAL CONT
50	1128744		STRAP, CONT OPERAT
51	236550		SCREW CONT M
52	1128896		CONTACT ASS
53	1164582		SCREW STOP BKT
54	338169		LOCKWASHER, STP BK
55	1135508		BRACKET, STOP MTG
56	1135506		ROD, PIVOT PWL STP
57	1135507		STOP CY CLU PAWL
57	1145515		STOP CYC CL PAWL
	SABRE 767 1415 7040 ABOVE SN 4613371		
58	46831		SPRING, PAWL STOP
59	1070020		CLEVIS, SLIDE LINK
60	1135511		SLIDE AND LINK STP
61	1070020		CLEVIS, LINELOCK
62	1128881		LINK, LINELOCK
63	1128863		BAIL ASM, KB LOCK
64	1138464		RETAINER, SLIDE
65	183835		SPRING, LOCKOUT
66	1091618		SPRING, LOCKOUT B
67	1128884		ROLLER, L/O BAIL
68	1128646		LEVER, LOCKOUT
69	1138384		RETAINER PAWL STOP
70	37913		NUT KEYBOARD LOCK
71	108114		SCREW, SOL BKT MTG
72	1135234		BRACKET, LKOUT LEV
73	1099884		GUIDE, PLUNGER
74	343755		PLUNGER, SOLENOID
101	1116343		SPRING, OPR LOCKOT
102	264641		CLIP C OPR LOCKOT
103	1132092		SHAFT,OPER LOCKOUT
104	1133600		LINK,OPER LOCKOUT
	TO REPLACE LINK ON MACHINES BELOW 4007200, REF 103 MUST BE REPLACED ALSO		
104	1000223		LINK
	USED WITH REF 83 CODE 511		
105	1134829		NUT, LKOUT BAIL
106	1124435		BELLCRANK, LOCKOUT
107	1928		SCREW, LKOUT BAIL
108	1133520		LINK, LOCKOUT BAIL
108	1141834		LINK LOCKOUT
	USED ON IMP CONTROL C&R		
109	1070020		CLEVIS, LKOUT BAIL
110	1123754		CLEVIS,LKOUT BAIL
111	1124434		BAIL, LOCKOUT
112	1110529		CLEVIS,KEYBD LOCK
113	1928		SCREW, LKOUT CLAMP
114	1159129		CLAMP, LKOUT LEVER
115	1134829		NUT, LKOUT CLAMP
116	1135714		LINK KB LKOUT
117	1092125		RETAINER LKOUT LNK
118	FOR REF ONLY USE REF 178,179,180		
119	123552		SPRING KEYBD LK
120	1071449		SPRING KEYBD INTLK
121	1107743		SPRING BELLCRANK
122	FOR REF ONLY USE REF 178,179,180		
123	1164578		SCREW LKOUT BAIL
124	1132009		BRACKET LKOUT BAIL
125	1141117		STUD BELL MTG
	USED ON MACHINES BELOW 4011720		
126	150735		SPRING BELL
127	1123623		BUTTON BELLCLAPPER
128	1133627		GROMMET BELL MTG
129	1138483		RETAINER BELL
130	1090970		SPACER BELL MTG
131	1133628		BELL
132	1132027		BELLCRANK ASM
133	219633		CLIP C BELL STUD
134	1073449		SPRING BELLCLAPPER
135	REF ONLY ORDER REF 173,174,175, 176 & 177		
136	264641		CLIP C BELLRINGER
137	257957		SCREW BELL BAIL LV
138	1106650		SPRING
138	1091069		SPRING NEW LC
	USED WITH LAST COLUMN SWITCH		

REF	P/N	SOURCE	DESCRIPTION
139	45677		WASHER BELLRINGER
140	1132021		BAIL BRG 1014/1415
140	1128173		BAIL BRINGER OTHER
141	1164584		SCREW BKT MTG
142	21636		SCREW EOL ACTUATOR
143	37913		NUT EOL ACTUATOR
144	1128788		ACTUATOR, CONTACT
145	1128790		CONTACT ASM EOL
	1415,1014 AND 7040/7044		
145	1135183		CONTACT ASM OTHERS
146	173204		SCREW, CONTACT MTG
147	105052		INSULATOR, SCREW
148	1135424		SHIELD, CONTACT A
149	118418		SCREW, TERMINAL
150	1128746		STRAP, CONTACT N/C
151	1261967		TERMINAL CONT SUPP
152	37435		INSULATOR PLATE
153	1128744		STRAP, CONTACT O/S
154	326119		SUPPORT CONT STP
155	339109		TERMINAL CONT
156	1135466		SPRING CONT BACKUP
157	1128745		STRAP, CONTACT N/O
158	1128789		BRACKET, CONT MTG
159	37435		INSULATOR PLATE
160	339113		SPRING CONT BACKUP
161	326067		STRAP CONT N/O
162	1128743		TERMINAL CONT
163	103895		SCREW TERMINAL
164	339109		TERMINAL CONT
165	1108445		STRAP CONT O/S
166	1135424		SHIELD EOL CONT
167	100464		INSULATOR SCREW
168	173205		SCREW CONT ASM MTG
169	265195		SCREW BELLRINGER S
170	1123622		STOP BELLRINGER
171	17514		WASHER
172	1118134		SPACER
173	1132013		SPACER
174	1164433		SPRING
175	1132012		LEVER BELL BAIL
176	1928		SCREW
177	1134829		NUT
178	1133597		LEVER KB LOCK
179	45119		SPRING
180	1133598		LEVER KB LOCK
181	1159241		LINK
182	1090472		WASHER
183	1159239		SPRING
184	1159443		CLEVIS
185	1135573		DIODE KBL SOL
186	1092125		RETAINER

CODE 924
(6400 PRIMARY PRINTER ONLY)

CODE-524

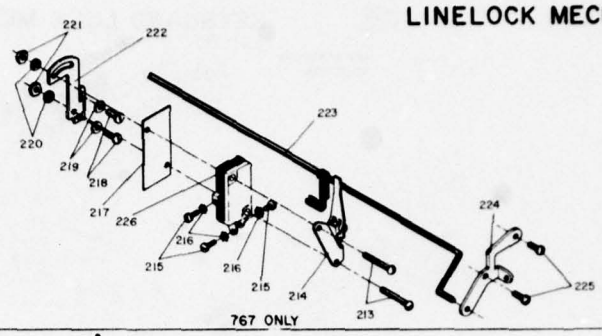
JANUARY 7, 1966

PAGE 24

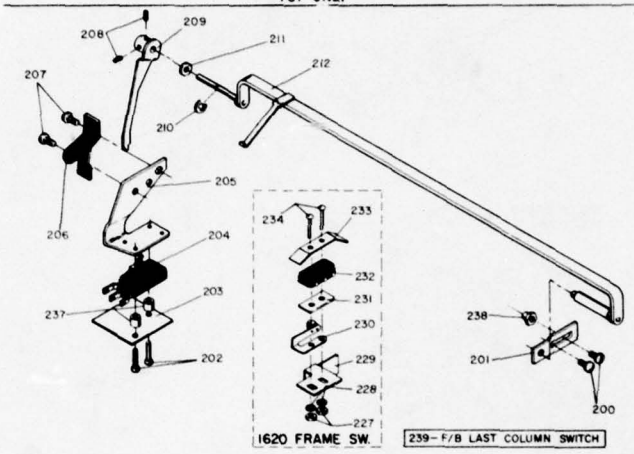
REF	P/N	SOURCE	DESCRIPTION
200	1117759		SCREW B RING BAIL
200	*1164579		SCREW B RING BAIL
201	1135991		BRKT B RNG BL ADJ
202	438541		SCREW LC CONT SW
202	438540		SCREW LC SW 870
203	1159119		GUARD LC CONT
204	1135993		SWITCH LAST COL
204	1159363		SWITCH ASM 775,870
205	1135978		BRACKET LC SW
206	1135979		SPRING ACT BACKUP
207	1164584		SCREW LC SW MT BKT
208	257956		SCREW LC ACT MTG
209	1135977		ACT ASM LC CONT
210	20069		C CLIP
211	1142245		SPACER B RING BAIL
212	1135990		BAIL 15 IN
212	1176865		BAIL ASM 835
212	1159083		BAIL 11 IN
213	PART OF	ACTUATOR ASM REF 214	
214	1144923		ACT ASM LC SWITCH
215	PART OF	SWITCH ASM REF 226	
216	PART OF	SWITCH ASM REF 226	
217	1145385		INSULATOR LC CONT
218	1117759		SCREW SW MTG BKT
219	6364		WASHER
220	PART OF	ACTUATOR ASM REF 214	
221	PART OF	ACTUATOR ASM REF 214	
222	1144918		BKT LC SW MTG
223	1144789		BAIL BELL CLAP
224	1144851		BKT BELL CL BAIL
225	1164582		SCREW
226	228093		SWITCH LAST COL
227	PART OF	ACTUATOR ASM REF 230	
228	PART OF	ACTUATOR ASM REF 230	
229	1159052		BRACKET FRAME SW
230	2106517		ACTUATOR FR SWITCH
231	27460		INSULATOR
232	353343		SWITCH FRAME 1620
233	1159053		INSULATOR
234	PART OF	ACTUATOR ASM REF 230	
237	125231		SPACER
238	* 257187		NUT BELL BAIL ADJ
	*USED WITH FIELD B/M REF 239 ONLY REAR ADJ SCREW		
239	1272121		B/M LAST COL 731
239	1272122		B/M LAST COL 735
240	37913		NUT LOCKING
241	1159286		SCREW ADJ
242	1159390		ACTUATOR
243	1159278		BAIL BELLRINGER
244	1135990		SPRING
245	27435		SPACER
246	1159388		BRACKET SWITCH
247	438542		SCREW BRKT MTG
248	1159544		SWITCH
249	438541		SCREW SWITCH MTG
250	45624		WASHER
251	47987		NUT

REF	P/N	SOURCE	DESCRIPTION

LINELOCK MECH.

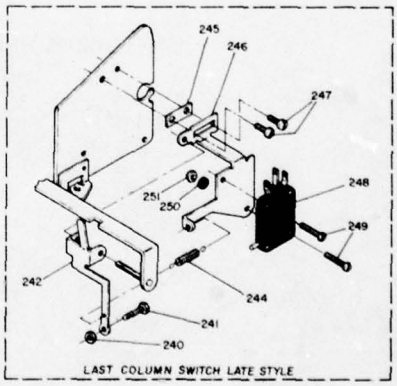


767 ONLY



1620 FRAME SW.

239- F/B LAST COLUMN SWITCH



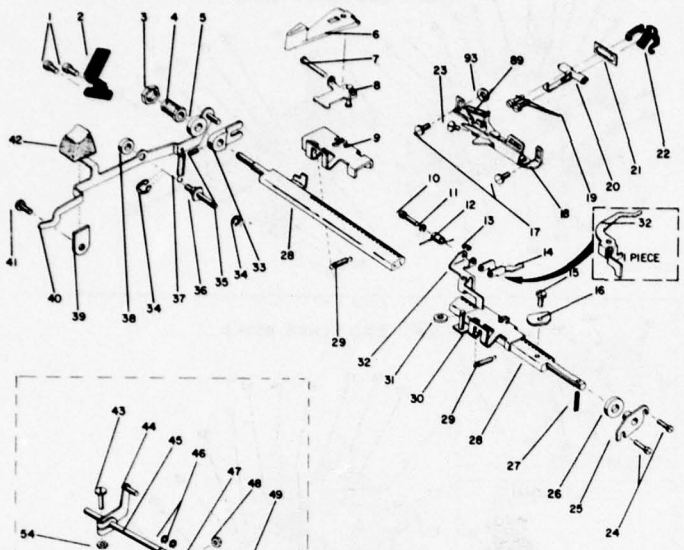
LAST COLUMN SWITCH LATE STYLE

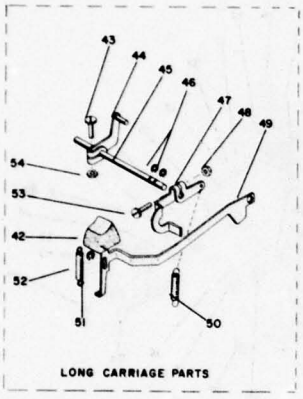
CODE 924
(6400 PRIMARY PRINTER ONLY)

CODE-524

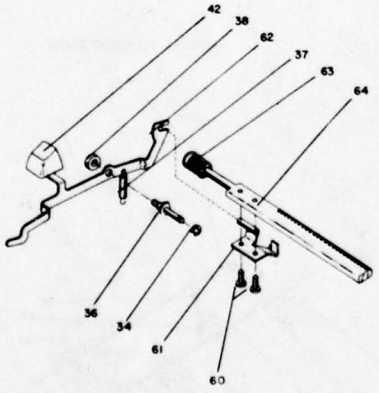
JANUARY 7, 1966

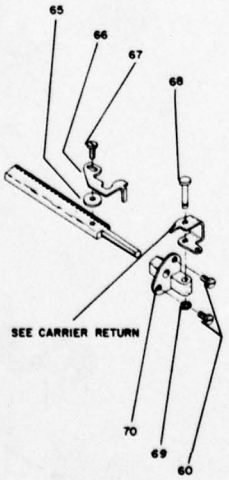
MARGIN MECH

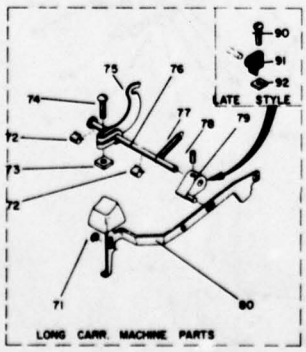




MARGIN MECH.







REF	P/N	SOURCE	DESCRIPTION
1	438566		SCREW MAR RACK RET
2	1128162		SPRING MAR RACK RE
3	10574		NUT MARGIN RACK
4	1123602		BUSHING LH MAR RAK
5	1127738		WASHER
6	1135083		LEVER MAR SET GRAY
6	1159149		LEVER DARK BLUE
6	1159352		LEVER LIGHT BLUE
7	1123611		PIN
8	1123610		PIN AND SLIDE ASM
9	1123615		STOP MARGIN LH
10	1132181		SHAFT BELLCRANK
11	251989		CLIP C SHAFT
12	1132183		SPRING BELLRINGER
13	1073418		CLIP C LEVER
14	1132019		ARM BELLRNGR BLCRK
15	1164576		SCREW MAR RACK ECC
16	1123605		ECCENTRIC MAR RACK
17	1127745		SCREW LINE LOCK BK
17	38262		SCREW LINE LK BKT
	SABRE 7090 1014 1620 870		
18	1135082		BRACKET LINE LOCK
18	1123640		BKT LINE LOCK 767
	ABOVE SN 4619312		
19	38262		SCREW POINTER MTG
20	1124703		POINTER 767
20	1135084		POINTER OTHER
21	1134888		WASHER POINTER BKT
22	1124702		BRACKET POINTER
23	1164578		SCREW LINE LK BKT
24	38261		SCREW MARGIN RACK
25	1123626		BUSHING RH 11 INCH
25	1128166		BUSHING RH 15 INCH
26	1127738		WASHER MARGIN RACK
27	2101794		PIN MARGIN RACK
28	1133510		RACK MAR 12P 11 IN
28	1128164		RACK MAR 12P 15 IN
28	1133508		RACK MAR 10P 11 IN
28	1128171		RACK MAR 10P 15 IN
29	1123812		SPRING MARGIN SET
30	1123618		STOP MARGIN RH
	WHEN INSTALLING IN PLACE OF OLD STYLE METAL MAR SET LEVER, REPLACE REF 32 ALSO.		
31	1141175		SPACER BELLCRANK
32	1133607		BELLCRANK ASM
32	1141474		BELLCRANK 1 PIECE
	WHEN INSTALLING ON MACH WITH 2 PIECE REPL REF 89		
33	1123603		LEVER MARG REL
34	1132122		CLIP C REL KEYLR
	USED ON MACHINES ABOVE 4032000		
35	257957		SCREW MAR REL LEVR
36	*1124020		STUD MAR REL PIVOT
37	1134837		SPRING MAR REL PVT
38	*1124019		SPACER MAR REL KEL
	*USED ON MACHINES BELOW 4012015		
39	1132242		STOP MARGIN REL
40	1128317		KEYLEVER 11 IN MAC
41	1132149		SCREW STOP MTG
42	1133807		KEYBUTTN 1014/1415
42	1124845		KEYBUTTON OTHERS
43	438550		SCREW MAR REL LH
44	1128065		LEVER LH MAR REL
45	1128066		SHAFT MAR REL
46	1073418		CLIP C SHAFT
47	1128063		LEVER RH MAR REL
48	37913		NUT MAR REL SCREW
49	1128323		KEYLEVER MAR REL
50	1116729		SPRING MAR REL KL
51	1073418		CLIP C REL KEYLVR
52	1133661		SPRING MAR REL LV
53	438550		SCREW MAR REL LV
54	37913		NUT MAR REL SCREW
60	1164582		SCREW
61	1128316		STOP SET LEV LH
62	1128317		KEYLEVER 11 IN
63	1074321		SPRING RACK RETURN
63	1145446		SPRING 767
64	1128313		RACK 10P 11 IN
64	1128315		RACK 12P 11 IN
64	1128305		RACK 10P 15 IN
64	1128307		RACK 12P 15 IN
64	1144760		RACK 10P 767
65	1141227		STOP SET LEV RH
66	1141229		GUIDE 11 IN
66	1141232		GUIDE 15 IN 767
67	1164576		SCREW
68	1141228		STUD CLUTCH UNLAT
69	264641		C CLIP
70	1141230		BUSHING 11 IN
70	1141231		BUSHING 15 IN
71	1073418		C CLIP
72	1141223		RETAINER
73	1134829		NUT MARGIN REL LH
74	1928		SCREW MAR REL
75	1128318		LEV MAR REL 15 IN
76	1128066		SHAFT MAR RL 15 IN
76	1144921		SHAFT MAR RL 767
77	1102139		SPRING MAR REL
78	257958		SCREW M REL LEV RH
79	FOR REF ONLY ORDER REF 90,91,92		
80	1128323		KEYLEVER MAR REL
89	123552		SPRING
90	1164619		SCREW MAR REL
91	1128322		CLAMP MAR REL
92	602229		NUT MAR REL
93	*1164158		SPACER LH
93	* 45639		SPACER LH 15 IN
	*USED WITH SAB 7040 1014 1620 870		

REF	P/N	SOURCE	DESCRIPTION

CODE 925
(6400 PRIMARY PRINTER ONLY)

CODE-525

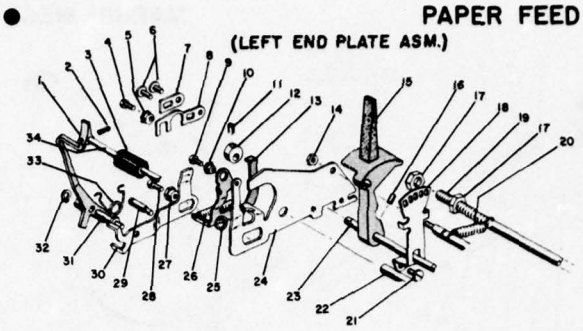
JANUARY 7, 1966

REF	P/N	SOURCE	DESCRIPTION
1	1124391		ARM PAPER BAIL LH
1	1164381		ARM LH 775
	ABOVE SN 4680295		
2	264998		PIN PAPER BAIL
3	1132230		ROLLER BAIL NYLON
3	1124397		ROLLER BAIL RUBBER
4	38350		SCREW PLTN ECC ADJ
5	1124370		ECCENTRIC NUT
6	38350		SCREW PLTN PLATE
7	1124373		PLATE ECC RETAIN
8	1124369		PLATE PLATEN ADJ
9	38348		SCREW LATCH 11 IN
9	38350		SCREW LATCH 15 IN
10	1124803		ECCENTRIC PLTN LTC
11	121521		SCREW COP CONT ECC
11	1071657		SCREW COP CONT ECC
	USED ON 11 INCH BELOW 4005500		
12	1124371		ECCENTRIC COPY CON
13	1124802		LATCH PLATEN LH
14	38051		NUT TIE ROD
15	1159220		LEVER COPY CONTROL
16	257958		SCREW COPY CONTROL
17	1091743		NUT BASE TIE ROD
18	1124383		DETENT COPY CONT
19	1124769		ROD BASE TIE 11 IN
19	1128075		ROD BASE TIE 15 IN
20	1133665		SPRING CARR 11 IN
20	1141586		SPRING 15 INCH
21	1117759		SCREW COPY CONT MT
22	1138143		SHAFT FD RL 11 IN
22	1124788		SHAFT FD RL 11 IN
	USED BELOW 4012015		
22	1128215		SHAFT FD RL 15 IN
23	1134954		SHAFT COPY 11 INCH
23	1124372		SHAFT COPY 11 INCH
	USED BELOW 4012015		
23	1128136		SHAFT COPY 15 INCH
24	1124379		PLATE LH
25	1124377		SPACER CARR GUIDE
26	1134837		SPRING PLTN LATCH
27	1124378		ECCENTRIC PLTN ADJ
28	38353		SCREW ECCENTRIC
29	1124579		STUD BAIL SPR LH
30	1133589		BRACKET CARR GUIDE
31	1132055		STUD PAPR BAIL ARM
31	*1135055		STUD BAIL ARM 775
32	528552		RETAINER PAPER BAI
33	1124396		SPRING PAPER BAIL
34	1124393		SHAFT BAIL 11 INCH
34	1128152		SHAFT BAIL 15 INCH
35	FOR REF ONLY ORDER REF 85 AND 87		
36	38051		NUT REL LEVER STUD
	USED ON 11 INCH BELOW 4012015		
37	1072703		SPRING PAPER REL
38	1128012		STUD REL LVR MTG
	USED ON ALL 15 INCH AND 11 INCH ABOVE 4012015		
38	1124366		STUD REL LEVER
	USED ON 11 INCH BELOW 4012015		
38	1271741		STUD REL LEVER
	TO REPLACE THE RELEASE LEVER OR ITS STUD ON 11 INCH BETWEEN S/N 4012015 AND 4031400, USE STUD NO 1128012 AND INDEX LEVER STUD NO 1128084		
39	1141184		ARM FD ROLL REL
40	1103695		RETAINER
41	108114		SCREW REL ARM
42	1124388		LEVER BAIL RH
42	1164380		LEVER RH 775
	ABOVE SN 4680295		
43	1124376		STUD PAPER BAIL
43	*1135055		STUD BAIL ARM 775
	*ABOVE SN 4608424		
44	1133590		BRACKET CARR GUIDE
45	251350		SCREW PAPER BAIL
46	1124801		LATCH PLATEN RH
47	1138149		PLATE ASM RH
47	1124363		PLATE ASM 11 INCH
	USED ON 11 INCH BELOW 4012015		
50	1073418		CLIP C LEVER
51	1128155		ARM CENTER 15 INCH
52	1132221		ROD TIE 11 INCH
52	1128149		ROD TIE 15 INCH
53	1100523		SCREW ARM MOUNTING
54	1128280		SCREW LEVER MTG
55	1128238		SCREW PAP FEED ADJ
56	1128239		SCREW FEED ROLL AR
57	1128234		ARM FNT FR ADJ LH
58	1128236		ARM FNT FR LH
59	1128350		SPRING FR TENSION
60	1128221		SPR FR TENS 15 IN
61	1128237		ARM FNT FR RH
61	1128235		ARM FNT FR ADJ RH
62	1138118		LEVER FD ROLL REL
63	265195		SCREW BRACE
64	1128146		ARM RH 15 INCH
64	1132228		ARM RH 11 INCH
65	1133593		RETAINER PAP FD MT
66	1132222		SCREW FD RL ARM
67	1092125		CLIP C SHAFT
68	1132219		ARM REAR FR RH
69	37913		NUT ECC STUD
70	1134773		STUD FD ROLL ARM
71	265195		SCREW BRACE
72	1124777		SPACER ECCENTRIC
73	1134829		NUT FD ROLL SCREW
74	1124788		SHAFT 11 INCH
	USED BELOW 4012015		
74	1138143		SHAFT 11 INCH
74	1128215		SHAFT 15 INCH
75	NOT AVAILABLE ORDER REF 55,56,60 61		
76	1132220		ECCENTRIC STUD
77	NOT AVAILABLE, ORDER REF 55,56,57 58		
78	1128151		ARM CTR 15 INCH RH
79	121521		SCREW SUPPORT
80	1164579		SCREW SUPPORT MTG
81	1141833		BRKT TRANS 15 INCH
82	1164577		SCREW BRKT 15 INCH
83	1128240		SUPPORT ROD 15 IN
84	1132214		SUPPORT TIE ROD
85	1135381		LEVER PAPER REL
86	1115633		GRIP CLIP
87	1164160		STOP LEVER
88	1164542		SHAFT FD RL 11 IN
88	1164499		SHAFT FD RL 15 IN
89	1103695		C CLIP

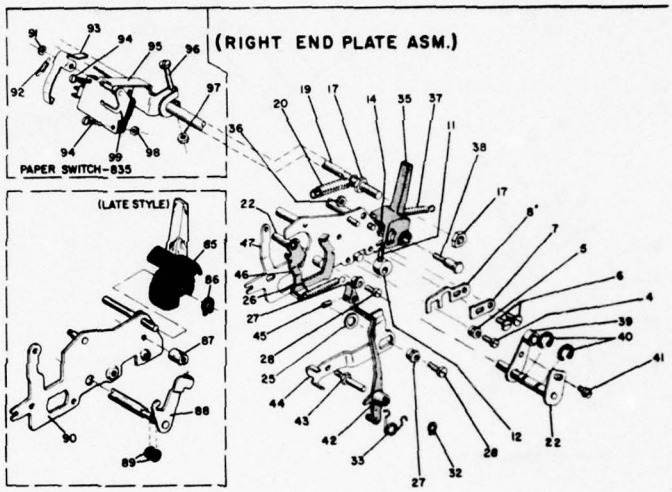
REF	P/N	SOURCE	DESCRIPTION
90	1128013		PLATE ASM RH
91	1073418		RETAINER
92	1134868		SPRING
93	1176855		ARM PAPER SWITCH
94	438541		SCREW
95	1176853		BRKT PAPER SWITCH
96	186759		SCREW
97	257187		NUT
98	47987		NUT
99	65266		SWITCH

PAPER FEED MECH.

(LEFT END PLATE ASM.)

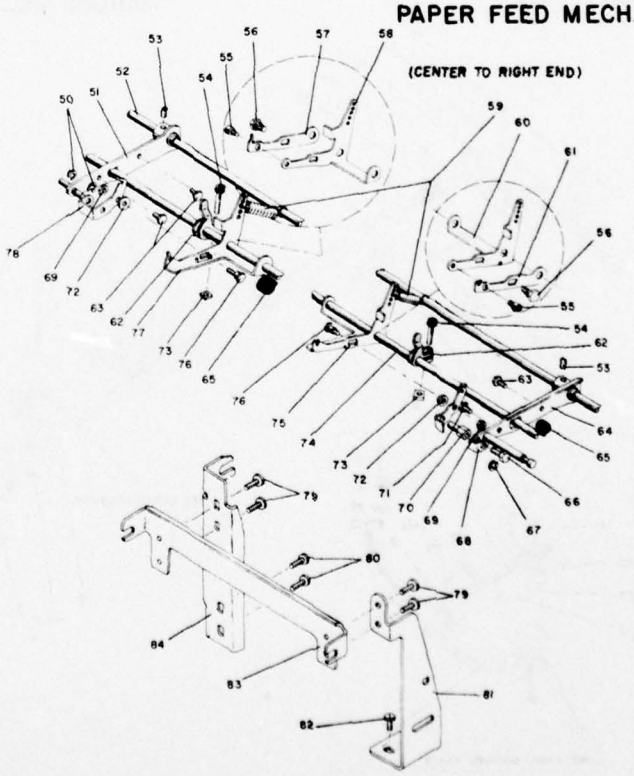


(RIGHT END PLATE ASM.)



PAPER FEED MECH.

(CENTER TO RIGHT END)

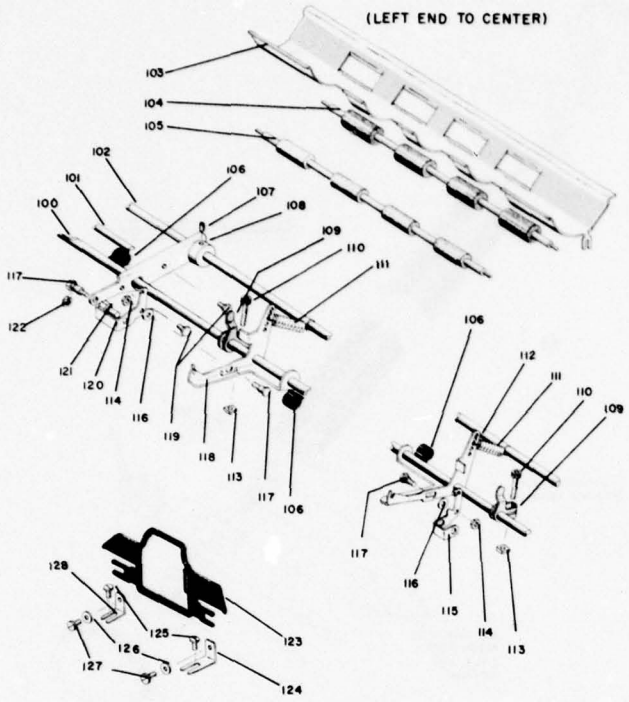


CODE-526

JANUARY 7, 1966

PAPER FEED MECH.

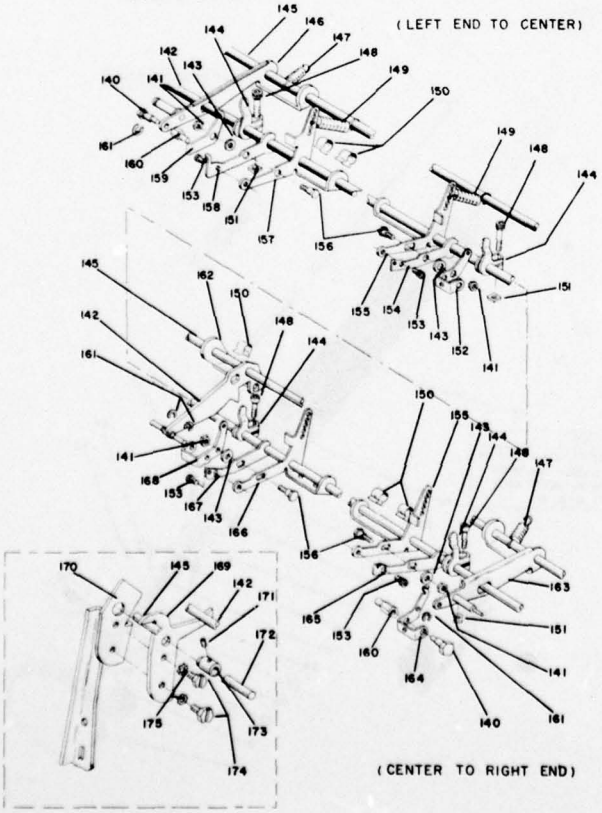
(LEFT END TO CENTER)



PAPER FEED MECH.

NOTE: THESE PARTS USED ABOVE 4086300-11 INCH, 4383500-15 INCH

(LEFT END TO CENTER)



(CENTER TO RIGHT END)

REF	P/N	SOURCE	DESCRIPTION
100	1124788		SHAFT FD RL 11 IN
	USED BELOW 4012015		
100	1138143		SHAFT FD RL 11 IN
100	1128215		SHAFT FD RL 15 IN
101	1134954		SHAFT COPY 11 INCH
101	1124372		SHAFT COPY 11 INCH
	USED BELOW 4012015		
101	1128136		SHAFT COPY 15 INCH
102	1132221		ROD TIE 11 IN
102	*1159574		ROD TIE 11 IN
102	1128149		ROD TIE 15 IN
102	*1159575		ROD TIE 15 IN
	*USED WITH DIE CAST COVERS		
103	1271549		DEFLECTOR 11 INCH
103	1271548		DEFLECTOR 15 INCH
104	1124776		FEED RL REAR 11 IN
104	1128138		FEED RL REAR 15 IN
105	1124782		FEED RL FNT 11 IN
105	1128141		FEED RL FNT 15 IN
106	1133593		RETAINER SHAFT
107	1100523		SCREW SET
108	1132227		ARM ASM 11 IN LH
108	1128145		ARM ASM 15 IN LH
109	1138118		LEVER FD RL REL
110	1128280		SCREW LEVER MTG
111	1128350		SPRING FR TENSION
112	NOT AVAILABLE ORDER REF 55,56,60, AND 61		
113	1134829		NUT FEED ROLL SCR
114	37913		NUT ECCENTRIC STUD
115	1128150		ARM CTR LH 15 INCH
116	1124777		SPACER ECCENTRIC
117	1132220		STUD ECCENTRIC
118	NOT AVAILABLE ORDER REF 55,56,57, AND 58		
119	265195		SCREW BRACE
120	1132218		ARM REAR LH
121	1134773		STUD FD RL ARM
122	1092125		C-CLIP
	CARD HOLDER		
123	1124601		10 PITCH
123	1141809		10P 731/735
123	1128532		10 P PIN FEED
123	1124602		12 PITCH
123	1141810		12P 731/735
123	1135780		12 P PIN FEED
124	1123829		BRACKET HOLDER RH
125	1141928		SCREW BKT MTG
126	1138796		WASHER CARD HOLDER
127	1091151		SCREW CARD HOLDER
128	1123830		BRACKET HOLDER LH
140	1132222		SCREW FD ROLL ARM
141	37913		NUT FD ROLL ARM SC
142	1124788		SHAFT FD RL 11 IN
	USED ON MACHINES BELOW 4012015		
142	1138143		SHAFT FD RL 11 IN
142	1128215		SHAFT FD RL 15 IN
143	1124777		SPACER
144	1138118		LEVER FD RL REL
145	1128275		ROD CARR TIE 11 IN
145	1128274		ROD CARR TIE 15 IN
146	1141267		ARM LH 11 INCH
146	1141277		ARM LH 15 INCH
147	1133665		SPRING CARR 11 IN
147	1141586		SPRING CARR 15 IN
148	1128280		SCREW REL LEVER
149	1128350		SPRING FR TENSION
149	1128221		SPRING FR TNS 15IN
150	1133593		RETAINER
151	1134829		NUT REL LEV SCREW
152	1128150		ARM REAR CTR LH 15
153	1128238		SCREW ADJ
154	1141298		ARM CTR ADJ 15 IN
155	1128237		ARM CTR LH 15 IN
156	1128239		SCREW FR ARM
157	1128236		ARM FNT FR LH
158	1128234		ARM FR ADJ LH
159	1132218		ARM REAR LH
160	1134773		STUD FD ROLL ARM
161	1073418		C-CLIP
162	1141282		ARM CTR 15 INCH
163	1141288		ARM RH 11 INCH
163	1141284		ARM RH 15 INCH
164	1132219		ARM REAR RH
165	1128235		ARM RH FNT
166	1128236		ARM CTR RH
167	1141298		ARM FR ADJ CTR 15
168	1128151		ARM REAR RH CTR 15
169	1141285		BRACKET SUPPORT
170	1128278		BRACKET SUPPORT
71	121521		SCREW
72	1134954		SHAFT COPY 11 INCH
172	1128136		SHAFT COPY 15 INCH
173	1141286		ECC COPY CNTL
174	265195		SCREW CTR BRACE
175	56772		WASHER

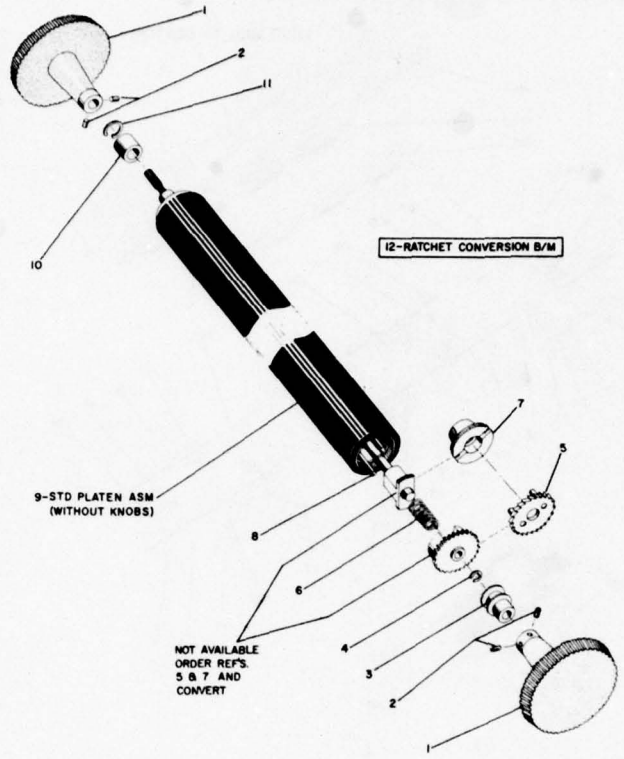
REF	P/N	SOURCE	DESCRIPTION

CODE-526

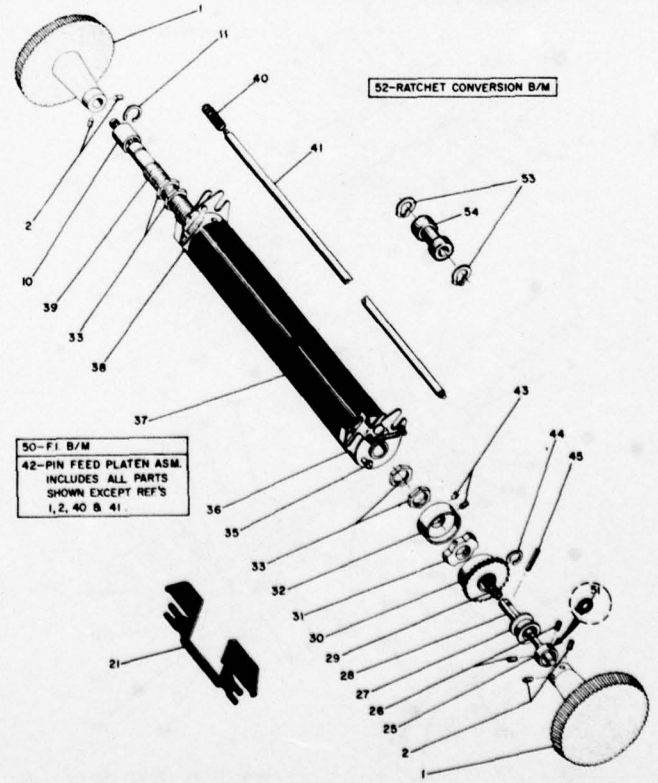
REF	P/N	SOURCE	DESCRIPTION
1	1135570		KNOB ASM BLUE LIGH
1	1135065		KNOB GRAY 11 IN
1	1159353		KNOB BLUE 11 IN
1	1159299		KNOB NAVY 11 IN
1	1135377		KNOB GRAY 15 IN
1	1159295		KNOB BLUE 15 IN
1	1159455		KNOB NAVY 15 IN
2	1100523		SCREW SET
3	1138361		BUSHING RH 11 INCH
3	1138360		BUSHING RH 15 INCH
4	251015		C-CLIP
5	1159549		RATCHET 36 TOOTH
5	1164463		RATCHET 27 TOOTH
5	1164462		RATCHET 24 TOOTH
6	1138363		SPRING PLTN VAR
7	1164476		DRIVER RATCHET
8	1138358		PIN PLTN VAR
9	1133594		PLATEN 27T 11 INCH
9	1128498		PLATEN 24T 11 INCH
9	1128127		PLATEN 27T 15 INCH
9	1141565		PLATEN 24T 15 INCH
10	1123549		BUSHING LH SHAFT
11	236571		RETAINER
12	1273657		B/M 4&8 LINE STAND
12	1272660		B/M 3&6 LINE STAND
21	1128532		CARD HOLDER 10P
21	1135780		CARD HOLDER 12P
25	REF ONLY ORDER REF 27&51		
26	REF ONLY ORDER REF 27&51		
27	1128523		BUSHING RH
	ORDER REF 51 ALSO		
28	1128525		ROD PUSH 11 INCH
28	1135337		ROD PUSH 15 INCH
29	1090568		SPRING PUSH ROD
30	1128527		RATCHET 27 TOOTH
30	1135192		RATCHET 36 TOOTH
31	1128528		DRIVER RATCHET
32	1128533		GUIDE VARIABLE
33	308459		NUT PLTN SHAFT
35	1100951		SCREW PINWHEEL
36	1128522		PINWHEEL RH
	CYLINDERS-PIN TO PIN LENGTH		
37	1128503		5-1/4 IN
37	1128506		6 IN
37	1128509		7-1/2 IN
37	1128512		8 IN
37	1128515		9 IN
37	1128518		9-3/8 IN
	THE FOLLOWING ARE FOR 15 INCH MACHINES ONLY		
37	1135325		9-7/8 IN
37	1135751		10 IN
37	1135328		10-1/8 IN
37	1135331		11-1/4 IN
37	1135753		11-1/2 IN
37	1135334		13-1/8 IN
38	1128521		PINWHEEL LH
39	1128531		SHAFT 11 INCH MACH
39	1135338		SHAFT 15 INCH MACH
40	1128529		SPRING COMP
41	1128530		ROD CAM ANCH 11 IN
41	1135323		ROD CAM ANCH 15 IN
	PIN FEED PLATEN ASSEMBLY 11 IN		
42	1128502		5-1/4 PTP 27T RAT
42	1128505		6 IN PTP 27T RAT
42	1128508		7-1/2 PTP 27T RAT
42	1135292		8 IN PTP 27T RAT
42	1135194		8 IN PTP 36T RAT
42	1128514		9 IN PTP 27T RAT
42	1128517		9-3/8 PTP 27T RAT
	PIN FEED PLATEN ASM 15 IN MACHINE		
42	1141976		5-1/4 PTP 27T RAT
42	1135761		6 IN PTP 27T RAT
42	1135762		6 IN PTP 36T RAT
42	1135763		7-1/2 PTP 27T RAT
42	1135764		7-1/2 PTP 36T RAT
42	1135765		8 IN PTP 27T RAT
42	1135766		8 IN PTP 36T RAT
42	1135767		9 IN PTP 27T RAT
42	1135768		9 IN PTP 36T RAT
42	1141977		9-3/8 PTP 27T RAT
42	1135324		9-7/8 PTP 27T RAT
42	1135754		10 IN PTP 27T RAT
42	1135756		10 IN PTP 36T RAT
42	1135327		10-1/8 PTP 27T RAT
42	1135757		10-1/8 PTP 36T RAT
42	1135330		11-1/4 PTP 27T RAT
42	1135758		11-1/4 PTP 36T RAT
42	1135755		11-1/2 PTP 27T RAT
42	1135759		11-1/2 PTP 36T RAT
42	1135333		13-1/8 PTP 27T RAT
42	1135760		13-1/8 PTP 36T RAT
43	257965		SCREW SET
44	236571		C-CLIP
45	1128526		PIN ROLL
	B/MS FOR FIELD INSTALLATION THE FOLLOWING B/MS CONTAIN ALL PARTS REQUIRED FOR FIELD INSTALLATION, NOTE-ON ALL ORDERS, SPECIFY THE PN FOR THE CYLINDER WITH THE DESIRED PIN-TO-PIN DIMENSION, THE PN FOR THE COLOR OF PLATEN KNOBS, AND THE PN FOR THE CORRECT PITCH CARD HOLDERS.		
50	1272076		F.I.B/M PF PL 11IN
50	1272078		F.I.B/M PF PL 15IN
	72 B/M - KNOBS NOT INCLUDED		
	NOTE-ALL DIMENSIONS SHOWN FOR PLATENS AND CYLINDERS ARE PIN-TO-PIN DIMENSIONS		
51	311072		GRIP RING
52	1272659		B/M 4&8 PIN FEED
52	1272661		B/M 3&6 PIN FEED
53	1176934		RETAINING RING
54	1176935		ROLLER PAP FEELER

REF	P/N	SOURCE	DESCRIPTION

STANDARD PLATEN ASSEMBLY



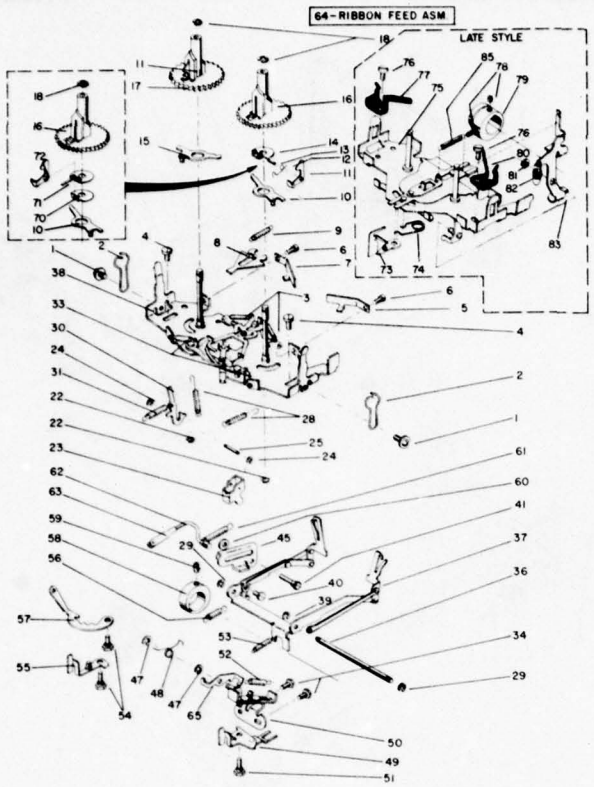
PIN FEED PLATEN ASSEMBLY



CODE-527

JANUARY 7, 1966

RIBBON MECH.



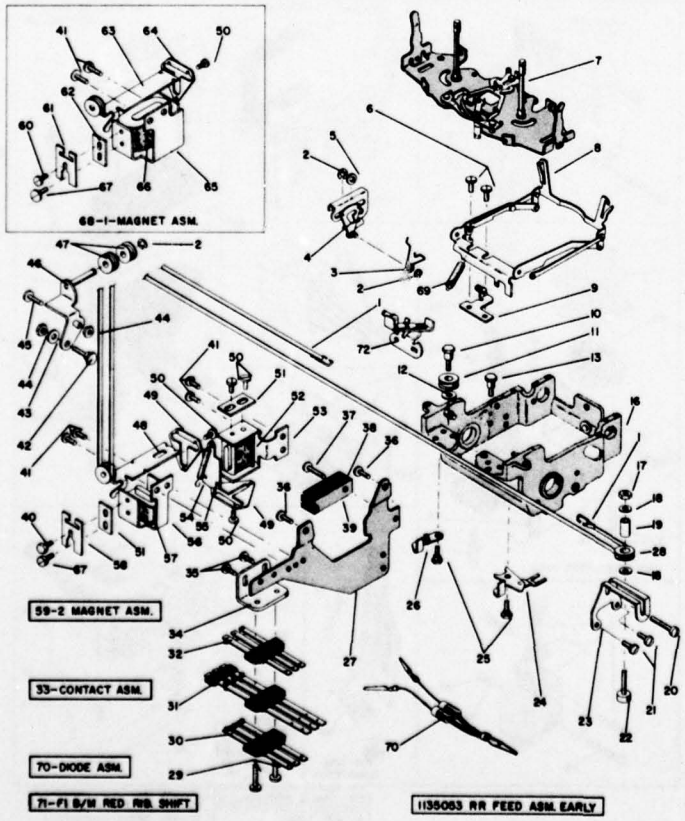
REF	P/N	SOURCE	DESCRIPTION
1	1141135		SCREW
2	1124191		SPRING, RETAINER
3	1091647		SPRING, REV INTERP
4	1164580		SCREW MTG
5	1124185		SPRING, RH BRAKE
6	15887		SCREW, BRAKE MTG
7	1132067		SPRING, LH BRAKE
8	1124679		LEVER, INTERPOSER
9	1091647		SPRING, REV INTERP
10	1132065		LEVER, REVERSE RH
11	1124144		TRIGGER, LH REV
11	1124149		TRIGGER, RH REV
12	1124155		SPRING TRIGGER
13	1124146		SHAFT, TRIGGER
14	1132157		BRACKET, TRIGGER
15	1132066		LEVER, REVERSE LH
16	1124148		RATCHET ASM, RH
17	1124143		RATCHET ASM, LH
18	219633		RETAINER, RATCHET
22	251989		RETAINER, ARM
23	1124122		BELLCRANK, FEED
24	251989		RETAINER, SHAFT
25	1124130		SHAFT, FEED PAWL
28	1124189		SPRING, RIB CENTER
29	219633		RETAINER, SHAFT
30	1124127		PAWL, RIBBON FEED
31	1074242		SPRING, FEED PAWL
33	123491		SPRING, DETENT LEV
34	1124826		SCREW, CAM FOLLOWER
36	1124662		SHAFT, LIFT
37	1124659		GUIDE ASM, LIFT
37	1159430		GUIDE ASM 765
38	1124123		PLATE ASM, RIBBON
38	1166063		PLATE 765
39	219633		RETAINER, LINK
40	1164578		SCREW LIFT ADJ
41	1124665		SCREW, FOLLOWER
45	1124663		FOLLOWER, LIFT
47	1073418		C-CLIP
48	1141304		SPRING
49	1124668		LEVER ASM, LOAD
50	1124151		FOLLOWER ASM, FEED
51	1124672		STUD, LOAD LEVER
52	1073863		SPRING, CAM FOLLOW
53	1100936		SPRING, LOAD
54	1124672		SCREW, LIFT LEVER
55	1124674		LEVER, RIBBON LIFT
56	1091073		SPRING, LIFT ARM
57	1124678		LEVER, LIFT CONTROL
58	1128730		CAM, RIBBON LIFT
58	1159507		CAM RIBBON LIFT
	ABOVE SN 4607632		
59	1127760		SCREW, LIFT CAM
60	1124664		SPACER, FOLLOWER
61	1090404		SPRING LIFT LINK
62	1124680		LINK, LIFT CONTROL
63	1070020		CLEVIS, PIN
64	1141165		FEED ASM, RIBBON
64	1135053		FEED ASM RED RIB
64	1164600		FEED ASM LATE

REF	P/N	SOURCE	DESCRIPTION
65	1141303		LATCH RIB FEED
	USE B/M 1271806 TO INSTALL STENCIL LOCKOUT PARTS ON MACHINES BELOW SN 4053100 11 IN, AND SN 4364790 15 IN		
70	1141801		BRACKET TRIGGER
71	1141800		SPRING TRIGGER
72	1141878		TRIGGER LH
72	1141889		TRIGGER RH
73	1164241		LEVER
74	1164237		SPRING DET LEVER
75	1164220		PLATE RIB FEED
76	1164580		SCREW
77	1128403		SPRING LH
78	257957		SCREW CAM
79	1164240		CAM FEED & DETENT
80	1128404		SPRING RH
81	219633		RETAINER
82	1091647		SPRING FEED LVR
83	1164236		LEVER RIB FEED
85	1164239		SPRING FEED PAWL

CODE-929
(6400 PRIMARY PRINTER ONLY)

CODE-529

RED RIBBON SHIFT MECH.



REF	P/N	SOURCE	DESCRIPTION
1	1159014		TAPE ASM RIB 11 IN
1	*1128930		CORD ASM OLD 11 IN
1	1159026		TAPE ASM RIB 15 IN
2	219633		C-CLIP
3	1128722		SPRING
4□□	1128721		FOLLOWER RED SHFT
5	1124664		SPACER
6	1164580		SCREW BKT MTG
7□□	1128716		PLATE ASM RED RIB
8□□	1128719		GUIDE ASM RED RIB
9	1128727		ARM ASM RIB LIFT
10	*1128732		STUD PULLEY-OLD
10	**1159009		STUD PULLEY-NEW
11	*1128731		PULLEY CARRIER-OLD
11	**1159004		PULLEY CARRIER-NEW
12	*1128734		SPACER-OLD
12	**1138796		SPACER-NEW
13	1128733		SCREW CORD ANCHOR
16□□	1128740		CARRIER CAST RED R
16	□1141200		CARRIER CASTING
	□WHEN REPLACING CARRIER CASTING ON 11 IN BELOW 4036419 & 15 IN BELOW 4354172, ORDER NYLON THRUST WASHER PN 1141189 AND ROCKER BEARING WASHER PN 1078497		
17	* 257186		NUT - OLD
17	** 37913		NUT-NEW
18	*1124247		WASHER - OLD
18	** 263680		WASHER-NEW
19	*1128911		SPACER - OLD
19	**1159016		SPACER-NEW
20	* 251283		SCREW - OLD
20	** 333182		SCREW-NEW
21	* 38261		SCREW - OLD
21	1164580		SCREW 11 IN NEW
21	236550		SCREW 15 IN NEW
22	*1128914		PIVOT RH - OLD
22	**1159010		PIVOT SCREW-NEW
23	*1128915		BRACKET RH - OLD
23	**1159008		BRACKET 11 IN-NEW
23	**1159027		BRACKET 15 IN-NEW
24□□	1128736		LEVER LOAD RED RIB
25	1124672		SCREW MTG
26□□	1128738		LEVER LIFT RED RIB
27	1128993		BRACKET CONT MTG
28	1159015		PULLEY RH
29	438550		SCREW
30	1128908		CONTACT N/O
31	1128924		CONTACT O/S
32	1128909		CONTACT N/C
33	1262789		CONTACT ASM
34	1128994		BRACKET CONTACT
35	341216		SCREW BKT MTG
36	1164580		SCREW BKT MTG
37	438549		SCREW TERM MTG
38	317767		BLOCK TERM
39	317766		INSULATOR BLOCK
40	1127785		SCREW
41	1117759		SCREW CORE MTG
42	1135593		SCREW LH BKT 11 IN
42	38352		SCREW LH BKT 15 IN
43	1090970		SPACER
44	38051		NUT 11 IN MACHINE

REF	P/N	SOURCE	DESCRIPTION
45	38350		SCREW 11 IN MACH
45	38352		SCREW 15 IN MACH
46	*1128916		BRACKET LH - OLD
46	**1159007		BRACKET LH - NEW
47	1128997		PULLEY - OLD
47	1159017		PULLEY - NEW
48	*1128995		ARMATURE RED R-OLD
48	**1159020		ARMATURE RED R-NEW
49	1128967		PLATE ARM HINGE
50	1164578		SCREW
51	1128965		STOP ARMATURE
52	1135134		COIL 48V
52	1266894		COIL 24V
53	1128959		CORE ASM BLACK RIB
54	1071691		SPRING AMRATURE
55	1128969		ARMATURE BLK RIB
56	1128962		CORE ASM RED RIB
57	1128964		COIL RED RIB 48V
57	1266893		COIL RED RIB 24V
58	1128966		BACKSTOP ARM
59	1159028		2 MAG ASM 1014
59	1159021		2 MAG ASM OTHERS
60	1164578		SCREW
61	1128966		BACKSTOP ARM
62	1128965		STOP ARMATURE
63	*1128741		ARMATURE ASM-OLD
63	**1159023		ARMATURE ASM-NEW
64	1128967		PLATE ARM HINGE
65	1128919		CORE ASM MAGNET
66	1128910		COIL 48V
66	1280358		COIL 24V
67	1132068		SCREW
68	1159024		1-MAGNET ASM
69	1124722		SPRING GUIDE ASM
70	1135643		DIODE ASM CM ANODE
70	1159420		DIODE ASM COM CATH
	*INDICATES PARTS USED WITH ROUND RIBBON SHIFT CORD		
	**INDICATES PARTS USED WITH FLAT MYLAR RIBBON SHIFT TAPE		
	□□USED ONLY ON MACHINES WITH RED RIBBON SHIFT		
71	1272005		B/M 1 MAG 11 INCH
71	1272007		B/M 1 MAG 15 INCH
71	1272006		B/M 2 MAG 11 INCH
71	1272008		B/M 2 MAG 15 INCH
72	1159167		FOLLOWER RED RIB

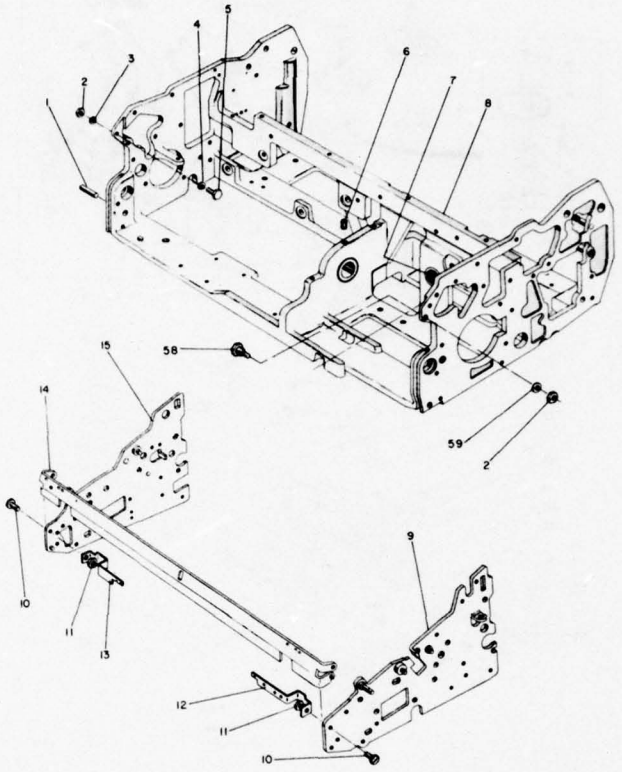
CODE-530

PAGE 30

REF	P/N	SOURCE	DESCRIPTION
1	326264		PIN 15 IN MACH
2	38051		NUT
3	6364		WASHER
4	1132185		ECCENTRIC LH 11 IN
5	1124296		SCREW LH 11 IN
5	1135592		SCREW
	USED WITH BEARING PLATE 1135590		
6	1132147		WICK CENTER BEAR
7	1145359		BEARING ESC SHAFT
8	FRAME, ASM POWER ORDER BY MACHINE S/N AND CARRIAGE LENGTH 11OR 15IN		
9	1128905		FRAME RH 11 IN
9	1135346		FRAME RH 15 IN
9	1176515		FRAME RH 935
9	1176860		FRAME RH 835
10	338238		SCREW
11	38214		NUT
12	1135163		ANCHOR KL SPR RH
13	1135164		ANCHOR KL SPR LH
13	1176904		ANCHOR LH 835 935
14	1141226		GUARD KEYLEVER
14	1134823		GUARD KL
	USED WITH STUD DOWNSTOP		
14	1128889		GUARD KL
	USED WITH ADJUSTABLE PLATE DWNSTP		
15	1128904		FRAME LH 11 IN
15	1135347		FRAME LH 15 IN
	USED ALSO FOR 935		
15	1176859		FRAME LH 835
58	38350		SCREW 767
58	1135593		SCREW OTHER
59	1074145		WASHER BRKT MOUNT

CODE-531

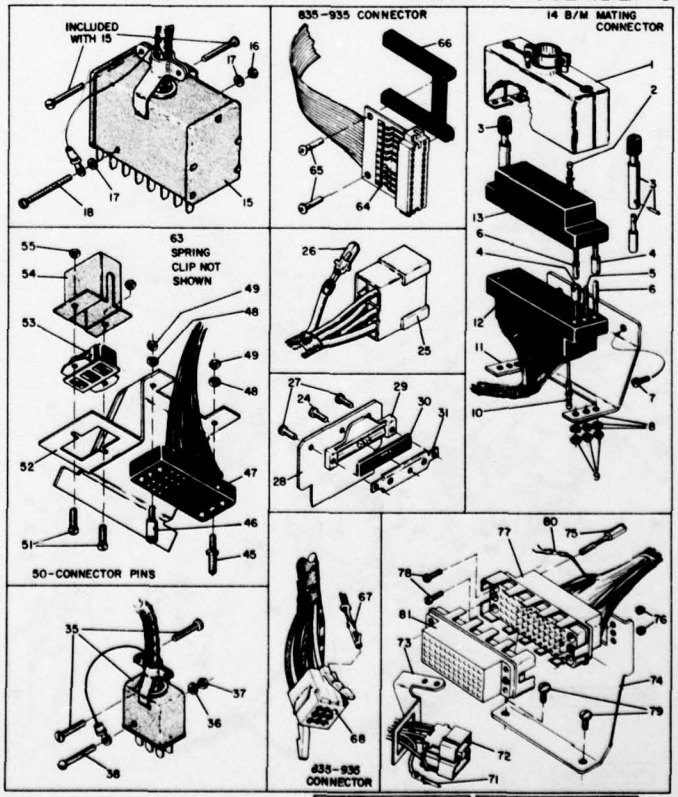
FRAMES



REF	P/N	SOURCE	DESCRIPTION
1	2127859		HOOD MATING CONN
2	2122259		SOCKET CONN FEMALE
2	2122261		SOCKET GROUND POS
3	2122628		JACKSOCKET LONG
4	2122735		SOCKET GUIDE CORNR
5	2122729		JACKSCREW FIXED
6	2122734		PIN CORNER GUIDE
7	1164576		SCREW CONN BRACKET
8	150209		WASHER LOCK
9	1127763		NUT GUIDE PINS
10	2122258		PIN MALE CONN
10	2122260		PIN GROUND ONLY
11	1166036		BRACKET CONN MTG
11	1159516		BRACKET 870
12	2122471		CONNECTOR BLK MALE
12	1159358		CONNECTOR MALE 775
13	2122472		CONNECTOR FEMALE
13	1272062		CONNECTOR FEMA 775
14	1159077		MATING CONN B/M
	INCLUDES ALL HARDWARE USED IN FEMALE CONNECTOR.		
15	1128657		CONN. STRETCH AEC
15	1128656		CONN. STRETCH ECS
16	8506		NUT
17	72318		WASHER
18	309983		SCREW
24	236550		SCREW PADDLE CONN
25	523268		HOUSING PLASTIC
26	523255		TAB
27	338238		SCREW PADDLE CONN
28	491349		CARD PADDLE
29	216209		SUPPORT PADDLE
30	216210		FILLER RUBBER
31	216208		CLAMP CABLE
35	321000		CONN. ASM
36	598203		WASHER
37	598201		NUT
38	598202		SCREW
45	PART OF REF 47		
46	PART OF REF 47		
47	532479		CONNECTOR BLOCK
48	PART OF REF 47		
49	PART OF REF 47		
50	523034		PIN
50	532902		PIN GROUND CONN
51	42361		SCREW 3-PLUG MTG
52	1135100		BRACKET SABRE
52	1159970		BRACKET
	USED WITH PM OPR CONTACTS		
53	300761		PLUG 3-SOCKET
54	1135019		INSULATION
55	77841		NUT
60	1135216		CABLE 1014
60	1128658		CABLE 1415
60	1128650		CABLE SABRE A&B
60	1128651		CABLE STRETCH ECS
60	1128652		CABLE STRETCH AEC
60	1135787		CABLE 1620 MOD II
60	1135285		CABLE 111INCH CORR
60	1135282		CABLE 111INCH BCD
60	1135354		CABLE 151INCH CORR
60	1135353		CABLE 151INCH BCD
60	1159356		CABLE 775
60	1159514		CABLE 870 15 IN
60	1159515		CABLE 870 11 IN
60	1166328		CABLE ASM 775
61	2108398		PIN TOOL
63	512403		SPRING CLIP
64	5800610		CONNECTOR CARD
65	595720		RIVET
66	5352967		STRAIN RELIEF
67	1166115		PIN CONN FEMALE
68	1166498		CONNECTOR BLOCK
69	1176929		CABLE ASM 835
70	1176511		CABLE ASM 935
71	1166114		PIN 6 POS CONN
72	1160983		CONN 6 POS MALE
73	1166358		BRKT 6 POS CONN
74	1166036		BRKT 60 POS CONN
75	744606		SCREW JACK
76	1134635		NUT CONN MTG
77	631647		CONN 60 POS MALE
78	38264		SCREW CONN MTG
79	1164577		SCREW BRKT MTG
80	1160976		PIN 60 POS CONN
81	631648		CONN 60 POS FEMALE

CODE-533

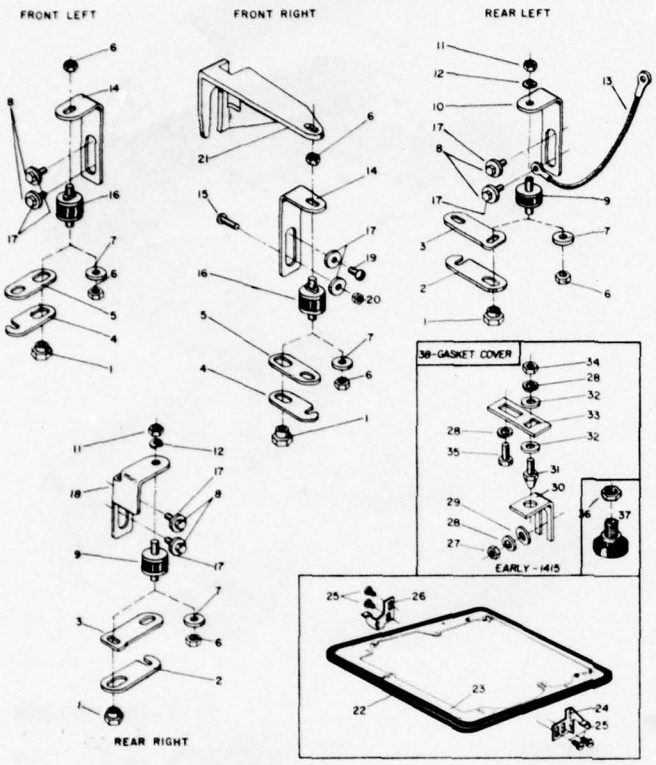
CABLE ASSEMBLIES



60- CABLE ASSEMBLIES | 69-835 CABLE ASSEMBLY
61- PIN TOOL | 70-935 CABLE ASSEMBLY

JANUARY 7, 1966

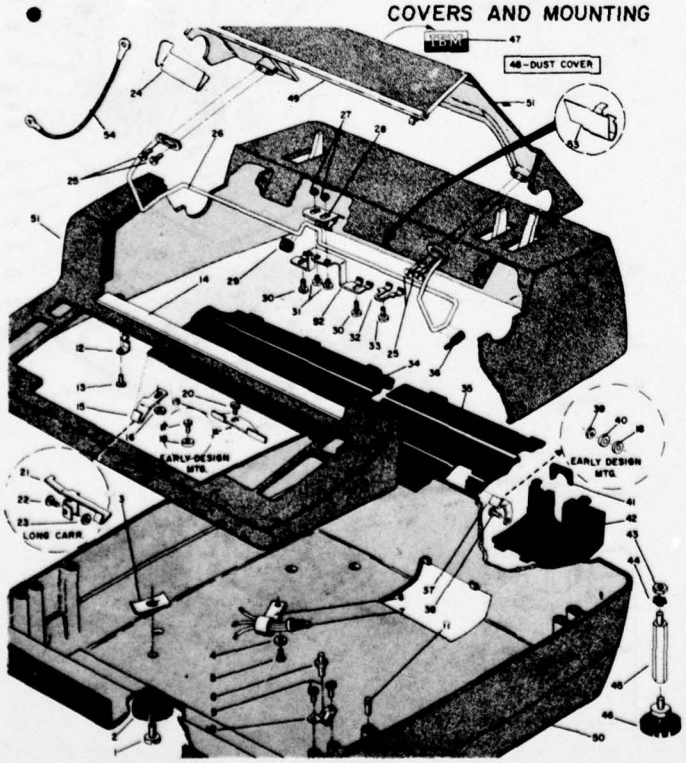
COVER MOUNTING



REF	P/N	SOURCE	DESCRIPTION
1	1141137		NUT, SHOCK MTG
2	1141138		PLATE, REAR MTG
3	1124317		BRACKET, COV REAR
4	1141139		PLATE, FRONT MTG
5	1124315		BRACKET, COV FRONT
6	1090041		NUT, RING MTG
7	1091388		WASHER, SHOCK MTG
8	1141136		SCREW, FRONT & RH REAR MTG
9	1135121		SHOCKMOUNT, REAR
10	1124318		BRACKET, REAR LH
11	*1090041		NUT, RM ONLY
11	* 163518		NUT, FS ONLY
12	*1072477		WASHER, RM ONLY
13	1110643		JUMPER, COV GROUND
14	1124316		BRACKET, COV 11 IN
15	35739		SCREW, BRK 11 INCH
15	38348		SCREW, BRK 15 INCH
16	1134857		SHOCKMOUNT, FRONT
17	1124461		WASHER, MRG BRACK
18	1124319		BRACKET, REAR RH
19	1117759		SCREW
20	257187		NUT, MTG BRACKET
21	1128179		BRACKET, 15 INCH
22	1135137		GASKET 11 INCH
22	1135374		GASKET 15 INCH
23	1135086		RING 11 INCH
23	1135144		RING ATO
23	1135244		RING STRETCH
23	1135376		RING 15 INCH
24	1135295		BRACE RH
25	1117759		SCREW
26	1135298		BRACE LH
27	257187		NUT BKT MTG
28	6364		WASHER LOCK
29	45690		WASHER BKT MTG
30	761197		TINNERMAN CLIP LH
30	761196		TINNERMAN CLIP RH
31	312615		STUD
32	257986		WASHER STUD MTG
33	761198		BRACKET COVER
34	257189		NUT STUD MTG
35	322550		SCREW BKT MTG
	*RM INDICATES RING MOUNTED COVER FS INDICATES FREE STANDING COVER		
36	24107		NUT
37	761200		FOOT
38	1135068		GASKET COVER

CODE-534

COVERS AND MOUNTING



REF	P/N	SOURCE	DESCRIPTION
1	1141092		SCREW, FOOT MTG
2	1117393		FOOT, BOTTOM COV
3	1091743		NUT FOOT MTG
4	1074145		WASHER CABLE CLIP
5	438549		SCREW CABLE CLIP
6	303538		CLAMP CABLE
7	1115061		CONNECTOR
8	1135118		STUD COV FASTENER
9	48594		SCREW SPRING FAST
10	*1135117		FASTENER 11 IN FS
10	363319		FASTENER 15 IN FS
10	*1135459		FASTENER RING MTG
11	1132200		PIN COVER ASM
12	1124330		LATCH CENTER COV
13	1164576		SCREW
14	1124326		TRIM MARGIN 11 IN
14	1135594		TRIM MARGIN 15 IN
15	1141052		CLIP LH SHO 11 IN
16	257187		NUT LH CLIP
17	1134854		SCREW FRONT MTG
17	341216		SCREW REAR MTG
18	1133634		WASHER FELT
19	1138383		CLIP SHIELD CENTER
20	1164580		SCREW
21	1141837		CLIP LH 15IN & 767
22	322551		SCREW MTG 15 INCH
23	257187		NUT MTG BKT 15 IN
24	1128283		GUIDE PAPER GAUGE
25	1164580		SCREW
26	1124337		HINGE 11 INCH
26	1128175		HINGE 15 INCH
27	257187		NUT COVR LAT
28	1135462		LATCH COVER OPEN
29	1138464		RETAINER
30	1164580		SCREW
31	1164576		SCREW
32	1124336		BRACKET COV HINGE
32	1166191		BRACKET HINGE
	USED ABOVE SN 4619512		
33	1117759		SCREW
34	1138380		SHIELD LH DUST
34**	1132126		SHIELD LH DUST
35	1138381		SHIELD RH 11 INCH
35	1135344		SHIELD RH 15 INCH
35	1145513		SHIELD 767
35**	1132127		SHIELD RH 11 INCH
35**	1128026		SHIELD RH 15 INCH
36	1141060		CLIP COVR INTERLK
37	1141051		CLIP SHIELD RH
37	1145537		CLIP RH 767
38	1117759		SCREW RH CLIP
39**	38051		NUT SHIELD MTG
40**	1132030		SPACER DUST SHIELD
	**OLD STYLE SCREW IN TYPE		
41	1135363		INSERT GROMMET
42	1135248		GROMMET BOT COVER
43	1091743		NUT LEG EXTENSION
44	76574		WASHER LOCK
45	*1135491		LEG FRAME RM
45	*1128543		LEG FRAME FS
	*RM INDICATES RING MOUNTED MACHINE FS INDICATES FREE STANDING.		

REF	P/N	SOURCE	DESCRIPTION
46	325625		FOOT WORK
47	1141177		DECAL IBM
47	1176945		DECAL 835
47	1176988		DECAL 935
48	1135432		DUST COVER 11 IN
48	1135433		DUST COVER 15 IN
49	1128180		SCALE 10P 15 IN
49	1124327		SCALE 10P 11 IN
49	1124347		SCALE 12P 11 IN
49	1128182		SCALE 12P 15 IN
	BOTTOM COVER ASSEMBLY		
50	1135455		1415
50	1135452		7040/7044
50	1135106		SABRE A
50	1135226		SABRE B CT RM 11IN
50	□1135107		1014 STRETCH
50	□1135104		ET 11 INCH
50	□1135371		ET 15 INCH
	CENTER AND TOP COVER		
51	□1135102		1415 STRETCH
51	1135222		SABRE ET RM 11 IN
51	1135103		1014
51	□1135221		ET 11 INCH
51	□1135366		ET 15 INCH
51	□1135367		ET 15 INCH RM
52	1124335		BRACKET HINGE
52	1166191		BRACKET HINGE
	USED ABOVE SN 4619512		
	□SPECIFY COLOR		
	1415		SPECIFY 814
	SABRE A TOP		SPECIFY 632
	SABRE A BOTTOM		SPECIFY 634
	SABRE B TOP&BOT		SPECIFY 632
	1014		SPECIFY 818
	1620 BOTTOM		SPECIFY 812
	1620 TOP&BOT		SPECIFY 803
	ON ET I/O, SPECIFY ONE OF THE FOLLOWING		
	COLOR		PAINT SPEC
	GARNET ROSE		635
	TOPAZ BRONZE		668
	EMERALD GREEN		669
	OPAL GRAY		678
	SCALE GRAY		632
	ONYX BLUE		679
	SAPPHIRE BLUE		674
	SANDSTONE BEIGE		680
	LIGHT GRAY TEK		803
	OFF WHITE VINYL		814
	I/O GRAY		818
	DP CHARCOAL		812
	SPECIAL COLOR SUBMIT SER		
53	1176857		PAP SWITCH LOCKOUT
54	1159636		GRND WIRE BOT CVR

CODE-935
(6400 PRIMARY PRINTER ONLY)

CODE-535

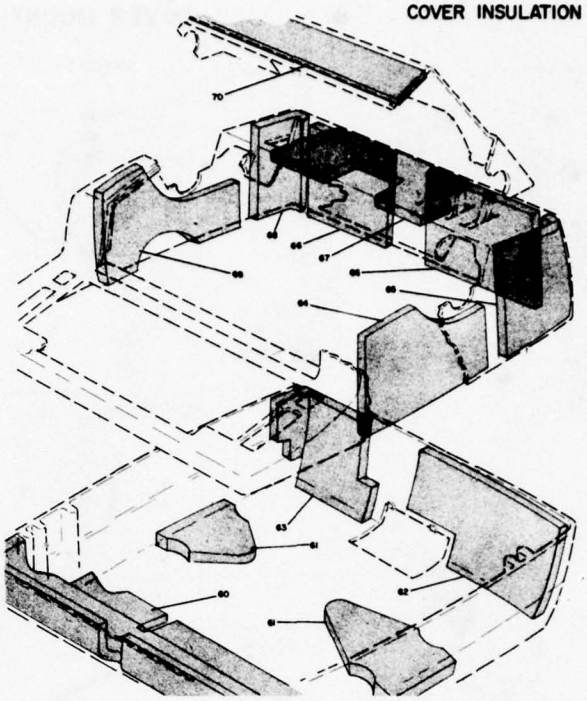
PAGE 32

REF	P/N	SOURCE	DESCRIPTION
60	1135259		INSULATION SABRE
60	1135260		INSULATION 11 IN
60	1135599		INSULATION 15 IN
61	1135448		INSULATION BOT COV
62	1135299		INSULATION BOT RS
63	1135261		INSULATION BOT LS
64	1135251		INSULATION CEN RS
65	1135255		INSULATION COR RH
66	1135253		INSULATION 11 IN
66	1135598		INSULATION 15 IN
67	1135256		INSULATION TOP CEN
68	1135254		INSULATION COR LH
69	1135252		INSULATION CEN LS
70	1135257		INSULATION 11 IN
70	1135597		INSULATION 15 IN
100	1159625		INSULATION 11 IN
100	1159630		INSULATION 15 IN
	BOTTOM COVER		
101	1159643		SABRE ET SABRE
101	1159646		1415
101	1159579		1014
101	1159647		7040
101	1159753		1620 731 ET
101	1159756		735 ET
101	1159762		775 870 15 IN
101	1159759		870 11 IN ET STRETCH
101	1176943		835-935
102	1128341		RETAINER
103	1159624		INSULATION 11 IN
103	1159631		INSULATION SABRE
103	1159629		INSULATION 15 IN
104	1159635		STUD BALL
106	1117641		INSERT REAR
107	1159599		INSULATION 11 IN
107	1159628		INSULATION 15 IN
108	1159632		CATCH
109	1164579		SCREW WITH RING
109	1164576		SCREW W/O RING
110	1132200		PIN GUIDE
111	1159627		INSULATION
112	1135248		GROMMET
113	1159626		INSULATION
114	1135363		INSERT
115	1159567		WASHER FNT FOOT
116	1159565		FOOT
117	1090622		WASHER MTG
118	322550		SCREW MTG
119	1116930		INSERT FNT FOOT
120	311642		SCREW FNT
121	1117391		MOUNT RUBBER FNT
121	1117865		MOUNT RUBBER REAR
122	1159562		MOUNT SHOCK FNT
123	1159652		SCREW FRONT FOOT
123	1159651		SCREW REAR FOOT
124	1159633		LEG REAR FREE STAN
124	1159634		LEG REAR RING MTG
125	3350		WASHER
126	131599		SPACER FREE STAND
126	1159559		SPACER WITH BOSSES
126	1159560		SPACER RING MTG
127	1159585		BRACKET RH REAR
127	1166037		BRKT RH REAR
	USED WITH PERMIS MAKE OP CONTACTS		
127	1159586		BRKT LH REAR 11 IN
127	1159584		BRKT LH REAR 15 IN
128	3550		WASHER
129	3960		NUT BKT MTG
130	1141136		SCREW BKT MTG
131	1159556		ROLLER 11 IN
131	1159557		ROLLER 15 IN
132	1135491		LEG FRONT
133	311642		SCREW BKT MTG
134	311642		SCREW SHIPPING
135	1159561		HANDLE
136	1164579		SCREW HANDLE
137	311642		SCREW BKT MTG
138	1159553		BRACKET RH FNT
138	1159554		BRACKET LH FNT
139	1159594		INSULATION
140	1159595		INSULATION 11 IN
140	1159596		INSULATION 15 IN
141	1164373		SCREW HINGE
142	1128283		GUIDE PAPER
143	1166033		HINGE LH
144	1164582		SCREW
145	1141520		LATCH COVER
146	1141177		DECAL IBM
146	1176945		DECAL 835
146	1176988		DECAL 935
147	1159597		INSULATION 11 IN
147	1159598		INSULATION 15 IN
148	1124084		SCREW HINGE
149	1164100		BRACKET HINGE
150	1166034		HINGE RH
151	1159593		INSULATION
152	1135739		VENT GRAY
152	1135740		VENT 731 735 775 870
153	1164576		SCREW VENT
	COVER CENTER		
154	1159752		1620 731 SABRE
154	1159755		735 ET
154	1159761		775 870 15 IN 935
154	1159758		1415ARS 1014 870 11 IN 7040 ET STRETCH
154	1176951		835
155	1159577		TRIM 11 INCH
155	1159578		TRIM 15 INCH
156	1159579		SCALE 10P 11 IN
156	1159580		SCALE 12P 11 IN
156	1159581		SCALE 10P 15 IN
156	1159582		SCALE 12P 15 IN
	COVER TOP		
157	1159760		775 870 15 IN
157	1159754		735
157	1159751		1620 731 SABRE
157	1176950		835 935
157	1159757		1415 1014 7040 ET STRETCH 870 11 IN
158	1159570		GASKET 11 INCH
158	1159573		GASKET 15 INCH
159	1159569		RING 11 INCH
159	1159572		RING 15 INCH
159	*1159639		RING 11 INCH
160	1159568		RING ASM 11 INCH
160	1159571		RING ASM 15 INCH
160	*1159638		RING ASM 11 INCH
	*USED TO ADAPT OLD STYLE TOP COVER TO TILT UP BOTTOM COVER		
161	538552		RETAINER
162	1141649		SHIELD LH 15 IN
162	1138380		SHIELD LH 11 IN
163	1141645		SHIELD RH 15 IN
163	1138381		SHIELD RH 11 IN
163	1159490		SHIELD RH 11 IN
	ABOVE SN 4615351		
164	1141051		CLIP SHIELD RH
164	1166040		CLIP RH 11 IN
164	USED WITH PM OPR CONTACTS		
165	1117759		SCREW RH CLIP
166	1138383		CLIP CENTER
167	1164580		SCREW CENTER CLIP
168	257187		NUT LH CLIP
169	1141052		CLIP LH 11 IN
169	1141635		CLIP LH 11 IN
	USED WITH IMP CONTROL C&R		
170	1141050		CLIP LH 15 IN
171	322551		SCREW CLIP 15 IN
172	257187		NUT BKT MTG 15 IN
	FI B/M - TILT UP COVERS		
	NOTE - WHEN ORDERING DIE CAST COVERS TO REPLACE SAND CAST COVERS - ORDER MTG B/M AND COVER B/M-SPECIFY PITCH AND PAINT SPEC		
	MTG B/M		
173	1272782		RING MTG 15 IN
173	1272781		RING MTG 11 IN
173	1272780		FREE STNDG 15 IN
173	1272779		FREE STNDG 11 IN
	COVERS B/M		
173	1272783		ALKYD PNT FS 11 IN
173	1272784		VINYL PNT FS 11 IN
173	1272785		ALKYD PNT RM 11 IN
173	1272786		VINYL PNT RM 11 IN
173	1272787		ALKYD PNT FS 15 IN
173	1272788		VINYL PNT FS 15 IN
173	1272789		ALKYD PNT RM 15 IN
173	1272790		VINYL PNT RM 15 IN
	NOTE-RM RING MTG - FS FREE STNDG		
	TILT UP BOTTOM COVER B/M		
173	1272437		SABRE
173	1272460		1620
174	1090970		WASHER
175	1166099		SIGN-SAFETY
176	6364		LOCKWASHER

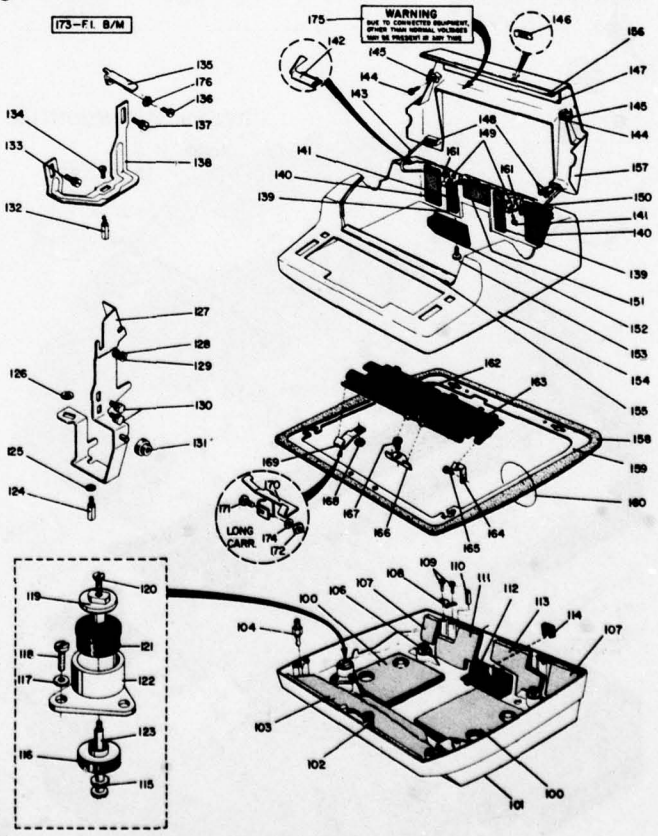
CODE-935
(6400 PRIMARY PRINTER ONLY)

CODE-535

COVER INSULATION

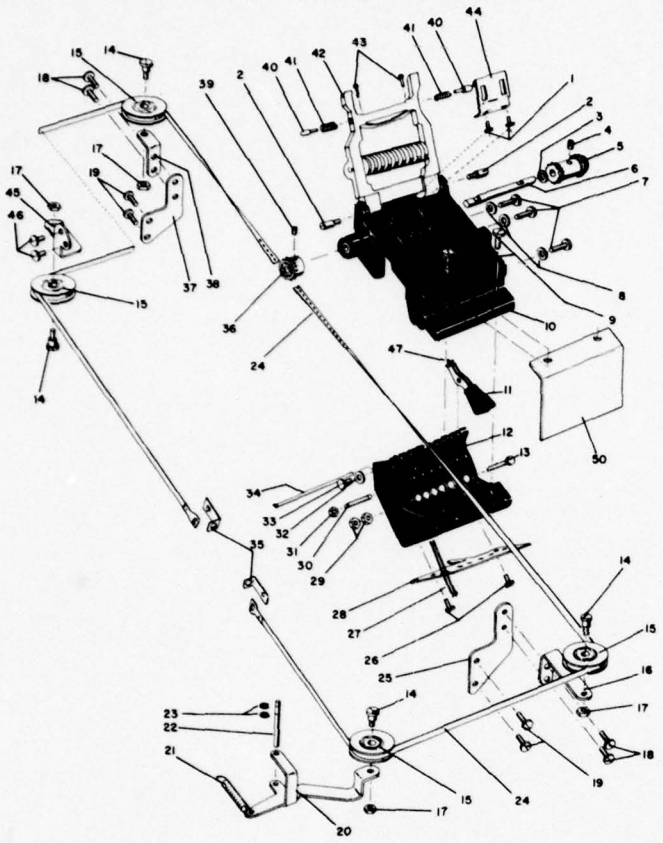


TILT-UP COVERS



JANUARY 7, 1966

HORIZ. PROG. UNIT & TAPE

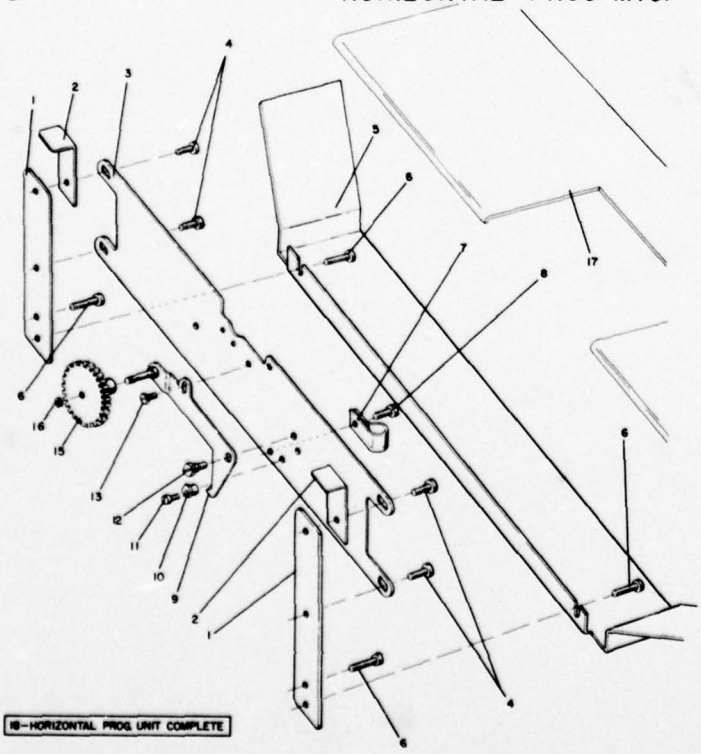


REF	P/N	SOURCE	DESCRIPTION
1	196298		SCREW
2	316542		STUD
3	123534		SHIM
4	165556		SETSCREW
5	344234		FEED WHEEL
6	1144988		SHAFT
7	38368		SCREW
8	344739		WASHER
9	25627		SCREW
10	1144964		TAPE TABLE
11	227874		STAR WHEEL ASM
12	316534		CONTACT BLOCK
13	314097		CONTACT SCREW
14	35739		SCREW
15	1144961		PULLEY
16	1144986		BRACKET
17	257187		NUT
18	186759		SCREW
19	81693		SCREW
20	1144983		BRACKET
21	1118346		SPRING
22	1144989		SHAFT
23	219633		C CLIP
24	1144952		DRIVE TAPE
25	1144984		BRACKET
26	196698		SCREW
27	1145487		WIRE CONTACT
28	316555		PLATE, COMMON
29	27073		NUT
30	26834		SCREW, STOP
31	27073		NUT
32	1090630		WASHER
33	186712		SCREW
34	316546		SHAFT
35	1144973		BRACKET, TAPE MTG
36	1144958		DRIVE WHEEL
37	1144984		BRACKET
38	1144985		BRACKET, PULLEY
39	257957		SETSCREW
40	316547		PIN, LOCK
41	345637		SPRING
42	316536		LID, TAPE
43	1090623		PIN
44	316548		PLATE, TAPE GUIDE
45	1144982		BRACKET
46	10170		SCREW
47	211985		STARWHEEL
50	1145564		COVER CONTACT WIRE

REF	P/N	SOURCE	DESCRIPTION

CODE—536

HORIZONTAL PROG MTG.



18—HORIZONTAL PROG UNIT COMPLETE

REF	P/N	SOURCE	DESCRIPTION
1	1144972		BRACKET
2	1280060		BRACKET
3	1144962		PLATE
4	236849		SCREW
5	1144971		TAPE GUIDE
6	25627		SCREW
7	435174		CLAMP
8	34512		SCREW
9	1144976		FOLLOWER GEAR MTG
10	1124370		ECCENTRIC
11	38350		SCREW
12	128714		SCREW
13	1128352		SCREW
15	1144959		FOLLOWER GEAR
16	219633		C CLIP
17	1145340		COVER, PROG UNIT
18	1144950		HORIZ PROG UNIT COMPLETE

REF	P/N	SOURCE	DESCRIPTION

CODE—537

Code	Ref.	Part No.
507	21	221
501	44	1035
502	84	1856
506	2	1856
507	15	1856
501	3	1928
516	115	1928
522	6	1928
524	107	1928
524	113	1928
524	176	1928
525	74	1928
503	65	2650
535	125	3350
535	128	3550
535	129	3960
502	105	6364
517	57	6364
524	219	6364
531	3	6364
534	28	6364
535	176	6364
502	114	6503
502	119	6503
508	92	6503
504	57	7341
517	63	8506
533	16	8506
536	46	10170
505	25	10514
512	22	10514
525	3	10574
516	45	15887
522	55	15887
529	6	15887
524	171	17514
516	251	20038
524	210	20069
524	142	21636
522	40	22066
511	10	23106
534	36	24107
536	9	25627
537	6	25627
536	30	26834
512	20	27073
536	29	27073
536	31	27073
524	245	27435
523	21	27460
524	231	27460
537	8	34512
523	70	35534
501	58	35665
501	118	35739
504	53	35739
511	21	35739
511	36	35739
524	23	35739
534	15	35739
536	14	35739
504	72	37435
511	63	37435
519	106	37435
520	88	37435
520	121	37435
523	2	37435
524	39	37435
524	152	37435
524	159	37435
502	35	37913
502	72	37913
502	110	37913
502	138	37913
503	43	37913
503	59	37913
503	74	37913
503	90	37913
503	135	37913
504	12	37913
505	18	37913
508	29	37913
508	231	37913
510	27	37913
515	20	37913
515	49	37913
516	51	37913
516	243	37913
517	1	37913
517	3	37913
517	20	37913
517	73	37913
518	5	37913
518	8	37913
518	12	37913
519	19	37913
519	34	37913
519	38	37913
519	137	37913
519	150	37913
519	160	37913
519	168	37913
519	186	37913
519	197	37913
524	6	37913
524	18	37913
524	70	37913
524	143	37913
524	240	37913
525	48	37913
525	54	37913
526	69	37913
526	114	37913
526	141	37913
530	17	37913
501	53	38051
502	12	38051
502	40	38051
502	104	38051
502	136	38051
504	13	38051
504	21	38051
508	7	38051
508	40	38051
508	76	38051
512	11	38051
512	24	38051
517	24	38051
519	171	38051
519	185	38051
520	83	38051
520	168	38051
522	56	38051
522	118	38051
526	14	38051
526	36	38051
530	44	38051
531	2	38051
535	39	38051
502	20	38214
502	143	38214
503	225	38214
508	46	38214
511	91	38214
520	56	38214
531	11	38214
502	19	38234
508	178	38250
505	27	38259
508	20	38261
508	219	38261
517	51	38261
525	24	38261
530	21	38261
508	13	38262
508	82	38262
510	52	38262
516	23	38262
525	17	38262
525	19	38262
519	73	38263
533	78	38264
501	114	38266
503	362	38346
511	21	38348
526	9	38348
534	15	38348
502	5	38350
502	8	38350
503	20	38350
508	17	38350
516	36	38350
526	4	38350
526	6	38350
526	9	38350
530	45	38350
531	58	38350
537	11	38350
502	140	38351
516	102	38351
522	78	38351
530	42	38352
530	45	38352
506	21	38353
526	28	38353
502	5	38354
536	7	38368
515	13	38562
508	257	38565
503	336	38566
533	51	42361
503	58	43373
503	100	43373
519	5	43373
524	179	45119
506	16	45183
508	197	45611
508	208	45611
524	250	45624
502	87	45638
515	47	45638
519	72	45638
503	75	45639
516	248	45639
519	119	45639
525	93	45639
524	139	45677
534	29	45690
503	32	46831
524	58	46831
502	76	47987
502	97	47987
503	319	47987
505	13	47987
516	265	47987
518	26	47987
524	251	47987
526	98	47987
535	9	48594
504	103	52359
501	160	55726
507	45	55729
502	22	56313
503	138	56722
503	302	56722
504	61	56722
504	109	56722
508	77	56722
508	91	56722
510	59	56722
510	101	56722
512	23	56722
516	16	56722
519	74	56722
526	175	56772
518	23	58852
502	13	62031
502	41	62031
520	57	62031
516	266	65266
526	99	65266
533	17	72318
535	44	76574
533	55	77841
536	19	81693
511	68	100229
519	127	100229
520	86	100229
524	45	100229
516	295	100237
519	115	100349
524	167	100464
502	175	103372
501	49	103689
524	163	103895
523	12	104278
523	22	104278
523	13	104676
504	71	105052
523	22	105052
523	76	105052
524	147	105052
515	56	108114
524	71	108114
526	41	108114
502	94	110956
520	129	114045
516	270	115070
504	9	118418
504	81	118418
511	64	118418
519	120	118418
520	92	118418
520	120	118418
520	164	118418
523	4	118418
524	43	118418
524	149	118418
526	11	121521
526	79	121521
526	171	121521
515	14	123491
515	30	123491
517	28	123491
519	1	123491
519	35	123491
529	33	123491
536	3	123534
517	83	123552
523	37	123552
524	119	123552
525	89	123552
524	237	125231
511	5	126572
537	12	128714
535	126	131599
511	47	150047
505	17	150209
533	8	150209
524	126	150735
534	11	163518
523	24	165556
536	4	165556
511	28	167790
503	115	170215
503	323	170215
520	130	173202
524	146	173204
504	82	173205
511	67	173205
513	12	173205
519	128	173205
520	85	173205
523	23	173205
524	46	173205
524	168	173205
504	70	173207
523	19	173207
519	116	173209
523	23	173213
523	19	173215
520	1	177939
501	67	179743
501	150	179743
503	389	179743
524	65	183835
506	2	186399
508	251	186712
536	33	186712
526	96	186759
536	18	186759
516	209	186923
503	134	186924
503	154	186927
536	1	196298
536	26	196698
523	72	198363
501	162	210883
501	163	210884
523	55	210921
501	164	210984
536	47	211985
533	31	216208
533	29	216209
533	30	216210
502	112	219633
503	5	219633
503	85	219633
503	89	219633
503	91	219633
503	304	219633
504	31	219633
507	42	219633
512	49	219633
513	14	219633
515	33	219633
516	30	219633
516	33	219633
516	131	219633
516	224	219633
516	305	219633
524	133	219633
529	18	219633
529	29	219633
529	39	219633
529	81	219633
530	2	219633
536	23	219633
537	16	219633
522	75	219743
536	11	227874
524	226	228093
503	72	236550
506	19	236550
519	173	236550
524	44	236550
524	51	236550
530	21	236550
533	24	236550
508	171	236571
527	11	236571
527	44	236571
537	4	236849
508	53	237245
527	4	251015
530	20	251283
516	127	251350
526	45	251350
503	38	251989
508	239	251989
522	36	251989
525	11	251989
529	22	251989
529	24	251989
501	116	257186
519	45	257186
530	17	257186
501	124	257187
502	1	257187
502	95	257187
503	55	257187
504	16	257187
510	112	257187
511	23	257187
515	35	257187
520	6	257187
524	238	257187
526	97	257187
534	20	257187
534	27	257187
535	16	257187
535	23	257187
535	27	257187
535	168	257187
535	172	257187
536	17	257187
534	34	257189
524	208	257956
503	315	257957
508	31	257957

PRECEDING PAGE BLANK-NOT FILMED

Code	Ref.	Part No.
508	45	257957
508	157	257957
515	51	257957
516	118	257957
516	129	257957
517	21	257957
519	71	257957
519	162	257957
522	96	257957
524	137	257957
525	35	257957
529	78	257957
536	39	257957
503	206	257958
508	73	257958
525	78	257958
526	16	257958
508	10	257959
508	151	257959
508	50	257961
527	43	257965
508	39	257969
510	10	257969
510	91	257969
515	6	257969
517	9	257969
517	45	257969
522	35	257969
522	69	257969
522	136	257969
508	50	257971
510	25	257975
510	111	257979
517	56	257984
520	14	257984
516	288	257985
522	106	257985
534	32	257986
502	6	263680
508	185	263680
530	18	263680
503	243	264641
503	357	264641
511	82	264641
519	55	264641
520	17	264641
520	64	264641
522	18	264641
522	82	264641
523	26	264641
524	102	264641
524	136	264641
525	69	264641
526	2	264998
501	7	265195
503	57	265195
503	70	265195
503	147	265195
510	39	265195
510	115	265195
516	143	265195
524	169	265195
526	63	265195
526	71	265195
526	119	265195
526	174	265195
533	53	300761
506	20	302090
507	2	302090
512	27	302090
523	48	302090
506	9	302131
507	3	302131
512	29	302131
523	47	302131
535	6	303538
527	33	308459
533	18	309983
527	51	311072
535	120	311642
535	133	311642
535	134	311642
535	137	311642
534	31	312615

Code	Ref.	Part No.
536	13	314097
519	112	316457
536	12	316534
536	42	316536
536	2	316542
536	34	316546
536	40	316547
536	44	316548
536	28	316555
516	118	316744
516	129	316744
501	158	317310
503	346	317766
523	74	317766
530	39	317766
503	345	317767
523	73	317767
530	38	317767
533	35	321000
501	117	322065
511	50	322065
519	3	322065
519	67	322065
519	183	322065
503	9	322550
534	35	322550
535	118	322550
504	53	322551
535	22	322551
535	171	322551
516	112	322665
510	2	324221
510	14	324221
510	81	324221
510	31	324497
510	121	324497
535	46	325625
519	114	326067
524	161	326067
504	76	326119
511	62	326119
519	107	326119
520	125	326119
523	7	326119
524	48	326119
524	154	326119
531	1	326264
502	124	332747
502	144	332747
506	16	333182
530	20	333182
512	36	333264
511	92	338169
524	54	338169
503	60	338238
508	261	338238
516	128	338238
516	254	338238
519	17	338238
519	118	338238
519	165	338238
531	10	338238
533	27	338238
519	113	339107
523	66	339107
519	110	339108
511	71	339109
511	72	339109
519	105	339109
520	91	339109
520	122	339109
523	3	339109
524	49	339109
524	155	339109
524	164	339109
504	74	339113
504	77	339113
511	60	339113
511	69	339113
519	109	339113
524	160	339113
502	21	340191
504	60	340191
504	62	340191

Code	Ref.	Part No.
520	9	340191
530	35	341216
535	17	341216
524	26	343752
524	74	343755
536	5	344234
516	294	344239
536	8	344239
536	41	345637
524	232	353343
503	353	355341
512	4	355341
517	50	355341
504	35	357820
504	42	357820
504	130	357820
502	75	358174
507	16	358174
516	52	358174
522	90	358174
524	33	358174
502	96	358509
503	320	358509
505	14	358509
516	287	358509
516	292	358509
535	10	363319
511	49	364816
506	29	369125
537	7	435174
516	246	438540
524	202	438540
502	92	438541
516	274	438541
524	202	438541
524	249	438541
526	94	438541
524	247	438542
501	126	438543
504	103	438546
503	343	438549
504	6	438549
507	1	438549
512	28	438549
516	116	438549
516	279	438549
523	49	438549
524	20	438549
530	37	438549
535	5	438549
503	218	438550
506	13	438550
525	43	438550
525	53	438550
530	29	438550
511	77	438552
501	130	438554
506	17	438554
508	161	438554
503	204	438558
503	388	438566
503	399	438566
503	405	438566
503	417	438566
503	421	438566
525	1	438566
503	137	469565
511	110	469565
513	41	469565
508	33	472729
508	71	472729
513	52	478394
533	28	491349
502	80	505071
533	63	512403
533	50	523034
533	26	523255
533	25	523268
517	54	528552
526	32	528552
533	47	532479
533	50	532902
535	161	538552
533	65	595720

Code	Ref.	Part No.
533	37	598201
533	38	598202
533	36	598203
503	338	602229
525	92	602229
533	77	631647
533	81	631648
533	75	744606
534	30	761196
534	30	761197
534	33	761198
534	37	761200
515	45	803278
516	145	803278
503	52	1000223
516	241	1000223
516	283	1000223
524	104	1000223
520	53	1014536
516	293	1018477
507	47	1066053
501	63	1070020
503	13	1070020
503	17	1070020
503	53	1070020
503	334	1070020
503	396	1070020
511	103	1070020
516	103	1070020
516	158	1070020
516	240	1070020
516	282	1070020
519	62	1070020
520	30	1070020
520	52	1070020
522	9	1070020
522	32	1070020
524	27	1070020
524	59	1070020
524	61	1070020
524	109	1070020
529	63	1070020
516	286	1070340
516	203	1071449
518	20	1071449
519	6	1071449
520	5	1071449
524	120	1071449
526	11	1071657
503	330	1071687
518	18	1071687
503	15	1071691
530	54	1071691
523	40	1072126
504	52	1072454
534	12	1072477
516	261	1072703
517	33	1072703
518	13	1072703
519	53	1072703
522	4	1072703
522	17	1072703
522	85	1072703
526	37	1072703
516	63	1072949
523	64	1073215
501	47	1073418
501	64	1073418
501	129	1073418
502	44	1073418
502	81	1073418
502	106	1073418
502	133	1073418
503	44	1073418
503	78	1073418
503	95	1073418
503	122	1073418
503	151	1073418
503	328	1073418
503	400	1073418
508	63	1073418
508	165	1073418
508	168	1073418
510	30	1073418

Code	Ref.	Part No.
510	108	1073418
511	106	1073418
516	105	1073418
516	155	1073418
516	201	1073418
516	231	1073418
516	236	1073418
516	239	1073418
516	262	1073418
516	306	1073418
518	22	1073418
519	23	1073418
519	129	1073418
520	2	1073418
522	13	1073418
522	48	1073418
522	72	1073418
522	94	1073418
524	35	1073418
525	13	1073418
525	46	1073418
525	51	1073418
525	71	1073418
526	50	1073418
526	91	1073418
526	161	1073418
529	47	1073418
503	120	1073449
516	56	1073449
516	213	1073449
516	255	1073449
524	134	1073449
501	9	1073462
503	363	1073863
511	39	1073863
516	205	1073863
516	210	1073863
517	25	1073863
518	16	1073863
519	50	1073863
520	38	1073863
522	95	1073863
529	52	1073863
516	206	1073866
517	34	1073866
504	99	1074145
531	59	1074145
535	4	1074145
511	31	1074242
516	234	1074242
516	275	1074242
522	27	1074242
529	31	1074242
525	63	1074321
511	42	1074556
519	101	1076948
501	52	1076978
508	216	1078497
534	6	1090041
534	11	1090041
522	43	1090050
505	10	1090162
511	41	1090162
515	8	1090162
522	16	1090162
522	88	1090162
523	30	1090162
516	256	1090165
524	8	1090175
504	108	1090254
522	115	1090254
502	23	1090268
508	214	1090268
519	174	1090336
519	182	1090336
503	133	1090341
503	46	1090343
503	83	1090343
513	54	1090343
517	12	1090343
519	37	1090394
511	7	1090404
524	12	1090404
524	34	1090404

Code	Ref.	Part No.
529	61	1090404
516	268	1090435
517	30	1090472
524	182	1090472
511	44	1090475
508	34	1090511
527	29	1090568
502	83	1090622
520	7	1090622
535	117	1090622
536	43	1090623
503	350	1090630
504	104	1090630
536	32	1090630
508	86	1090657
504	102	1090933
517	18	1090970
524	130	1090970
530	43	1090970
535	174	1090970
516	308	1091057
524	138	1091069
529	56	1091073
526	127	1091151
534	7	1091388
518	23	1091618
524	66	1091618
529	3	1091647
529	9	1091647
529	82	1091647
516	49	1091670
526	17	1091743
535	3	1091743
535	43	1091743
502	15	1092125
502	73	1092125
503	249	1092125
505	9	1092125
511	1	1092125
511	9	1092125
515	9	1092125
519	44	1092125
519	153	1092125
519	187	1092125
519	194	1092125
520	11	1092125
520	19	1092125
520	31	1092125
520	51	1092125
520	73	1092125
522	119	1092125
524	117	1092125
524	186	1092125
526	67	1092125
526	122	1092125
524	73	1099884
501	42	1100523
503	7	1100523
504	27	1100523
510	35	1100523
510	45	1100523
510	48	1100523
510	128	1100523
516	2	1100523
516	11	1100523
522	11	1100523
526	53	1100523
526	107	1100523
527	2	1100523
520	161	1100668
515	30	1100936
529	53	1100936
507	9	1100937
517	5	1100937
519	139	1100937
519	167	1100937
519	181	1100937
512	3	1100938
503	127	1100951
527	35	1100951
525	77	1102139
526	40	1103695
526	89	1103695
501	115	1104286

Code	Ref.	Part No.
524	138	1106650
501	16	1107025
524	121	1107743
507	7	1107794
522	29	1107794
520	16	1107795
519	103	1108350
520	87	1108350
520	128	1108350
524	165	1108445
503	131	1110529
515	3	1110529
516	103	1110529
524	112	1110529
534	13	1110643
524	16	1110668
519	69	1115017
520	69	1115017
501	70	1115061
535	7	1115061
520	175	1115633
522	61	1115633
526	86	1115633
503	325	1115735
502	128	1116023
516	235	1116343
524	101	1116343
525	50	1116729
535	119	1116930
535	121	1117391
535	2	1117393
516	160	1117488
511	5	1117589
519	9	1117589
535	106	1117641
501	17	1117759
501	155	1117759
503	1	1117759
503	47	1117759
503	230	1117759
503	303	1117759
503	342	1117759
503	384	1117759
503	404	1117759
503	414	1117759
503	419	1117759
516	117	1117759
520	61	1117759
520	70	1117759
523	46	1117759
524	200	1117759
524	218	1117759
526	21	1117759
530	41	1117759
534	19	1117759
534	25	1117759
535	33	1117759
535	38	1117759
535	165	1117759
535	121	1117865
524	172	1118134
536	21	1118346
522	1	1118361
503	418	1119359
503	398	1123520
516	104	1123520
516	114	1123526
520	55	1123532
527	10	1123549
503	23	1123556
510	22	1123559
510	12	1123566
510	94	1123566
510	6	1123570
510	87	1123570
510	47	1123571
510	126	1123571
510	46	1123572
510	125	1123572
510	32	1123573
510	123	1123573
510	44	1123574
510	122	1123574
510	41	1123575

Code	Ref.	Part No.
510	43	1123576
510	120	1123576
510	42	1123577
510	119	1123577
510	23	1123579
510	38	1123580
510	113	1123580
510	40	1123581
510	117	1123581
510	33	1123582
510	36	1123582
510	106	1123582
510	127	1123582
511	3	1123585
511	100	1123586
508	186	1123588
510	71	1123588
510	130	1123588
519	102	1123590
511	6	1123591
515	5	1123591
510	26	1123593
510	34	1123593
510	85	1123593
510	107	1123593
511	88	1123593
510	15	1123594
525	4	1123602
525	33	1123603
525	16	1123605
525	8	1123610
525	7	1123611
525	9	1123615
525	30	1123618
524	170	1123622
524	127	1123623
525	25	1123626
519	60	1123627
519	61	1123628
519	64	1123629
519	65	1123631
525	18	1123640
504	34	1123641
504	51	1123641
504	43	1123652
503	11	1123677
508	38	1123679
503	12	1123681
504	23	1123683
504	26	1123685
503	82	1123687
503	88	1123688
502	26	1123692
502	27	1123695
502	25	1123696
502	49	1123702
502	50	1123704
502	116	1123712
502	113	1123713
502	111	1123714
502	137	1123715
502	101	1123718
502	115	1123721
502	121	1123722
502	132	1123724
502	131	1123725
502	16	1123736
502	120	1123741
502	2	1123749
502	3	1123750
502	9	1123751
524	4	1123754
524	110	1123754
504	47	1123769
515	12	1123774
503	19	1123775
502	134	1123779
508	215	1123785
503	35	1123787
503	36	1123788
503	34	1123789
503	37	1123790
503	33	1123791
503	30	1123792

Code	Ref.	Part No.
522	46	1123807
522	67	1123810
522	130	1123810
525	29	1123812
511	12	1123819
508	206	1123822
508	206	1123823
508	206	1123824
508	206	1123825
503	68	1123827
508	67	1123827
515	25	1123827
508	188	1123828
526	124	1123829
526	128	1123830
515	10	1123831
503	253	1123947
503	252	1123948
503	251	1123949
503	250	1123950
503	221	1123956
503	6	1123961
503	248	1123963
503	256	1123968
503	300	1123969
517	64	1123973
517	72	1123977
517	53	1123979
517	71	1123982
520	4	1123984
517	23	1123987
522	24	1124010
517	69	1124014
525	38	1124019
525	36	1124020
516	126	1124073
516	148	1124074
516	139	1124075
516	122	1124076
516	136	1124081
516	132	1124082
515	27	1124083
515	28	1124084
535	148	1124084
515	23	1124087
518	24	1124094
516	43	1124095
515	26	1124098
516	39	1124098
516	66	1124098
515	27	1124109
516	122	1124110
529	23	1124122
529	38	1124123
529	30	1124127
529	25	1124130
529	17	1124143
529	11	1124144
529	13	1124146
529	16	1124148
529	11	1124149
529	50	1124151
529	12	1124155
502	61	1124157
508	1	1124158
508	2	1124161
508	9	1124162
508	4	1124163
508	36	1124166
508	19	1124167
508	18	1124168
508	15	1124169
508	51	1124174
508	23	1124176
508	30	1124178
508	181	1124179
529	5	1124185
508	204	1124188
529	28	1124189
508	187	1124190
529	2	1124191
508	155	1124196
508	192	1124197
508	190	1124204

Code	Ref.	Part No.
511	28	1124206
524	12	1124206
508	163	1124217
508	150	1124218
508	179	1124219
508	193	1124220
508	220	1124224
508	218	1124234
512	15	1124234
503	128	1124247
507	14	1124247
516	44	1124247
530	18	1124247
522	37	1124259
522	51	1124261
522	59	1124266
522	52	1124267
522	53	1124268
522	70	1124271
522	65	1124273
522	71	1124276
501	113	1124281
522	12	1124284
522	8	1124285
508	47	1124287
510	29	1124290
516	111	1124290
522	47	1124292
531	5	1124296
534	5	1124315
534	14	1124316
534	3	1124317
534	10	1124318
534	18	1124319
535	14	1124326
535	49	1124327
535	12	1124330
535	52	1124335
535	32	1124336
535	26	1124337
535	49	1124347
526	47	1124363
526	38	1124366
526	8	1124369
526	5	1124370
537	10	1124370
526	12	1124371
526	23	1124372
526	101	1124372
526	7	1124373
526	43	1124376
526	25	1124377
526	27	1124378
526	24	1124379
526	18	1124383
526	42	1124388
526	1	1124391
526	34	1124393
516	29	1124394
520	18	1124396
526	33	1124396
526	3	1124397
501	61	1124410
503	233	1124411
524	111	1124414
503	208	1124430
503	222	1124430
503	209	1124433
503	223	1124433
524	106	1124435
518	19	1124450
518	19	1124450
518	19	1124450
519	27	1124453
511	22	1124461
534	17	1124461
516	3	1124462
519	31	1124463
515	16	1124469
519	32	1124472
517	6	1124476
519	8	1124478
518	10	1124489
516	6	1124503

Code	Ref.	Part No.
516	4	1124506
511	40	1124508
511	35	1124509
516	9	1124519
515	7	1124538
517	46	1124538
517	77	1124555
501	8	1124562
519	26	1124567
518	4	1124568
508	176	1124572
508	175	1124573
526	29	1124579
519	63	1124600
526	123	1124601
526	123	1124602
519	47	1124608
519	48	1124609
519	46	1124610
519	157	1124610
519	189	1124610
518	6	1124612
518	11	1124613
518	3	1124614
518	7	1124615
518	21	1124616
518	4	1124618
502	172	1124622
516	26	1124624
516	25	1124628
519	28	1124628
516	24	1124629
516	37	1124630
516	21	1124634
502	4	1124636
519	25	1124638
516	38	1124639
516	1	1124641
516	35	1124643
508	21	1124646
508	22	1124647
508	14	1124648
529	37	1124659
529	36	1124662
529	45	1124663
529	60	1124664
530	5	1124664
529	41	1124665
529	49	1124668
529	51	1124672
529	54	1124672
530	25	1124672
529	55	1124674
529	57	1124678
529	8	1124679
529	62	1124680
503	216	1124682
502	7	1124683
522	20	1124697
522	83	1124697
510	55	1124702
525	22	1124702
525	20	1124703
508	174	1124707
508	177	1124708
508	154	1124712
522	15	1124722
522	79	1124722
530	69	1124722
503	213	1124732
501	17	1124740
501	52	1124744
508	156	1124745
520	68	1124756
520	71	1124762
520	50	1124764
519	41	1124766
520	72	1124766
519	42	1124767
526	19	1124769
520	65	1124772
522	41	1124773
519	13	1124775
519	136	1124775

Code	Ref.	Part No.
522	45	1124775
526	104	1124776
526	72	1124777
526	116	1124777
526	143	1124777
526	105	1124782
526	22	1124788
526	74	1124788
526	100	1124788
526	142	1124788
526	46	1124801
526	13	1124802
526	10	1124803
501	65	1124811
501	68	1124812
522	63	1124819
502	82	1124821
529	34	1124826
508	95	1124827
516	226	1124827
508	169	1124830
508	198	1124831
508	213	1124832
508	209	1124835
508	211	1124836
522	127	1124836
508	180	1124838
525	42	1124845
520	3	1124850
519	2	1124870
516	106	1124875
501	60	1124880
517	13	1124885
516	208	1124890
501	54	1127055
519	111	1127273
504	44	1127712
504	45	1127714
511	45	1127714
517	29	1127714
508	170	1127722
517	58	1127722
508	167	1127723
515	4	1127727
520	37	1127727
520	58	1127727
515	11	1127728
520	59	1127728
504	32	1127730
503	81	1127733
511	33	1127733
515	17	1127733
515	32	1127733
515	34	1127733
515	43	1127733
516	12	1127733
517	74	1127733
519	68	1127737
525	5	1127738
525	26	1127738
502	109	1127741
520	14	1127741
508	162	1127742
516	222	1127744
525	17	1127745
504	55	1127753
504	55	1127754
504	55	1127755
504	55	1127756
504	55	1127757
508	68	1127760
529	59	1127760
508	35	1127762
502	72	1127763
502	110	1127763
504	101	1127763
517	55	1127763
520	15	1127763
533	9	1127763
502	142	1127764
516	101	1127764
516	152	1127765
508	189	1127767
508	189	1127768

Code	Ref.	Part No.
508	189	1127769
508	191	1127770
508	191	1127771
508	191	1127772
508	191	1127773
508	191	1127774
508	217	1127775
503	352	1127785
523	44	1127785
530	40	1127785
503	92	1127787
503	93	1127790
503	86	1127791
516	34	1127794
516	32	1127796
516	31	1127798
522	33	1127930
522	25	1127936
519	22	1128008
526	38	1128012
526	90	1128013
520	34	1128017
520	27	1128018
518	4	1128024
518	4	1128025
535	35	1128026
516	126	1128028
516	122	1128029
515	27	1128032
515	27	1128037
516	122	1128038
508	5	1128047
508	15	1128048
508	6	1128054
502	52	1128055
504	54	1128062
525	47	1128063
525	44	1128065
525	45	1128066
525	76	1128066
504	55	1128071
526	19	1128075
520	21	1128076
520	36	1128079
520	35	1128081
520	22	1128083
520	25	1128084
502	141	1128086
502	52	1128087
502	115	1128090
502	56	1128091
503	8	1128095
519	24	1128099
515	16	1128101
519	21	1128103
519	21	1128103
517	6	1128105
515	29	1128107
516	1	1128108
515	37	1128113
519	67	1128113
519	18	1128122
519	16	1128125
508	11	1128126
527	9	1128127
526	23	1128136
526	101	1128136
526	172	1128136
526	104	1128138
526	105	1128141
503	140	1128144
503	308	1128144
526	108	1128145
526	64	1128146
526	52	1128149
526	102	1128149
526	115	1128150
526	152	1128150
526	78	1128151
526	168	1128151
526	34	1128152
526	51	1128155
510	22	1128161
525	2	1128162

Code	Ref.	Part No.
525	28	1128164
525	25	1128166
519	59	1128167
519	47	1128168
519	48	1128169
519	159	1128169
519	188	1128169
525	28	1128171
524	140	1128173
535	26	1128175
534	21	1128179
535	49	1128180
535	49	1128182
508	12	1128184
503	64	1128186
522	92	1128189
522	76	1128190
522	87	1128192
522	89	1128193
522	77	1128195
522	80	1128199
515	24	1128201
518	1	1128202
515	36	1128204
526	22	1128215
526	74	1128215
526	100	1128215
526	142	1128215
503	153	1128216
515	31	1128216
526	59	1128221
526	149	1128221
515	19	1128226
526	57	1128234
526	158	1128234
526	61	1128235
526	165	1128235
526	58	1128236
526	157	1128236
526	166	1128236
526	60	1128237
526	155	1128237
526	55	1128238
526	153	1128238
526	56	1128239
526	156	1128239
526	83	1128240
504	50	1128259
517	15	1128270
517	26	1128271
526	145	1128274
526	145	1128275
526	170	1128278
526	54	1128280
526	110	1128280
526	148	1128280
508	206	1128281
535	24	1128283
535	142	1128283
516	61	1128290
516	60	1128291
503	235	1128293
515	26	1128301
516	50	1128301
520	13	1128302
522	114	1128303
525	64	1128305
525	64	1128307
525	64	1128313
525	64	1128315
525	61	1128316
525	40	1128317
525	62	1128317
525	75	1128318
525	91	1128322
525	49	1128323
525	80	1128323
519	9	1128325
510	19	1128326
510	61	1128326
510	103	1128326
503	152	1128327
516	110	1128336
516	142	1128338

Code	Ref.	Part No.
519	8	1128338
525	102	1128341
526	59	1128350
526	111	1128350
526	149	1128350
507	56	1128352
519	30	1128352
537	13	1128352
522	113	1128355
504	52	1128356
522	117	1128356
515	18	1128366
516	6	1128368
517	6	1128374
503	210	1128382
503	212	1128382
511	89	1128382
516	20	1128385
516	15	1128386
516	14	1128387
519	130	1128397
515	39	1128400
515	40	1128401
529	77	1128403
529	80	1128404
503	247	1128409
520	9	1128411
510	11	1128413
510	92	1128413
508	243	1128434
508	242	1128436
508	249	1128438
508	240	1128442
508	250	1128449
508	162	1128450
508	238	1128451
508	236	1128455
508	230	1128456
508	252	1128457
508	246	1128458
508	232	1128459
522	58	1128471
520	172	1128477
520	20	1128483
501	45	1128490
508	245	1128493
508	247	1128495
527	9	1128498
527	42	1128502
527	37	1128503
527	42	1128505
527	37	1128506
527	42	1128508
527	37	1128509
527	37	1128512
527	42	1128514
527	37	1128515
527	42	1128517
527	37	1128518
527	38	1128521
527	36	1128522
527	27	1128523
527	28	1128525
527	45	1128526
527	30	1128527
527	31	1128528
527	40	1128529
527	41	1128530
527	39	1128531
526	123	1128532
527	21	1128532
527	32	1128533
535	45	1128543
512	36	1128544
512	36	1128545
504	11	1128550
502	78	1128553
502	99	1128555
502	77	1128556
502	90	1128557
502	93	1128558
502	102	1128562
502	103	1128563
503	14	1128573

Code	Ref.	Part No.
502	91	1128580
507	5	1128582
507	13	1128583
507	10	1128584
507	23	1128585
507	24	1128586
507	20	1128587
507	18	1128588
507	19	1128589
507	4	1128591
507	22	1128592
503	62	1128598
505	20	1128598
507	8	1128598
512	9	1128598
513	1	1128598
505	28	1128604
505	1	1128605
505	2	1128606
505	3	1128607
505	4	1128608
505	5	1128609
505	6	1128610
505	7	1128611
505	22	1128613
505	11	1128616
505	23	1128622
505	26	1128623
505	8	1128624
505	19	1128625
505	12	1128626
505	15	1128627
503	69	1128632
503	123	1128632
503	87	1128633
503	18	1128636
524	25	1128644
524	68	1128646
524	14	1128647
524	15	1128648
524	13	1128649
533	60	1128650
533	60	1128651
533	60	1128652
533	15	1128656
533	15	1128657
533	60	1128658
511	20	1128660
513	28	1128661
513	8	1128663
513	9	1128666
513	10	1128669
519	51	1128673
516	211	1128674
518	15	1128674
520	39	1128674
512	35	1128675
512	33	1128676
512	32	1128679
512	13	1128680
512	2	1128682
512	37	1128683
512	1	1128684
507	53	1128685
512	10	1128686
511	34	1128688
511	34	1128688
511	73	1128689
511	38	1128692
513	11	1128694
513	7	1128697
512	5	1128698
513	15	1128703
513	16	1128704
513	17	1128705
513	4	1128706
512	19	1128707
512	18	1128710
512	17	1128712
512	16	1128713
512	21	1128714
530	7	1128716
530	8	1128719
530	4	1128721

Code	Ref.	Part No.
530	3	1128722
530	9	1128727
529	58	1128730
530	11	1128731
530	10	1128732
530	13	1128733
530	12	1128734
530	24	1128736
530	26	1128738
508	24	1128740
530	16	1128740
530	63	1128741
511	66	1128743
519	125	1128743
523	10	1128743
524	42	1128743
524	162	1128743
511	65	1128744
519	104	1128744
520	127	1128744
523	9	1128744
524	50	1128744
524	153	1128744
504	75	1128745
511	61	1128745
519	108	1128745
520	124	1128745
523	6	1128745
524	47	1128745
524	157	1128745
504	80	1128746
511	70	1128746
519	124	1128746
520	163	1128746
523	11	1128746
524	41	1128746
524	150	1128746
519	101	1128748
519	117	1128749
519	121	1128749
516	229	1128751
516	228	1128752
516	230	1128753
516	227	1128759
516	46	1128762
516	225	1128763
516	247	1128764
516	41	1128768
516	40	1128770
522	57	1128785
501	112	1128787
516	104	1128787
524	144	1128788
524	158	1128789
524	145	1128790
506	27	1128794
506	11	1128795
506	11	1128798
506	11	1128803
506	12	1128806
506	12	1128809
506	12	1128812
506	18	1128815
506	14	1128816
506	5	1128817
506	25	1128818
506	7	1128819
506	24	1128820
506	23	1128821
506	6	1128822
506	15	1128823
506	1	1128824
506	4	1128825
506	3	1128826
506	10	1128827
506	22	1128828
524	17	1128828
506	8	1128829
504	8	1128830
504	84	1128830
504	83	1128831
504	73	1128832
523	63	1128832
504	79	1128833

Code	Ref.	Part No.
504	78	1128834
504	20	1128837
504	18	1128838
504	19	1128839
506	27	1128844
523	53	1128847
511	34	1128848
506	27	1128849
516	204	1128859
516	207	1128862
524	63	1128863
503	25	1128866
503	29	1128868
522	28	1128871
503	31	1128873
524	31	1128874
524	28	1128877
524	30	1128879
524	36	1128880
524	62	1128881
524	37	1128882
517	22	1128883
524	67	1128884
524	29	1128885
531	14	1128889
524	21	1128890
516	202	1128891
524	32	1128892
522	30	1128893
503	254	1128895
524	52	1128896
524	38	1128897
531	15	1128904
531	9	1128905
530	30	1128908
530	32	1128909
530	66	1128910
530	19	1128911
530	22	1128914
530	23	1128915
530	46	1128916
530	65	1128919
530	31	1128924
524	19	1128928
530	1	1128930
522	68	1128932
522	10	1128935
522	84	1128935
523	53	1128938
523	53	1128939
523	18	1128946
523	16	1128947
523	17	1128948
523	27	1128952
523	25	1128954
523	50	1128958
523	33	1128959
530	53	1128959
523	32	1128962
530	56	1128962
503	358	1128964
523	45	1128964
530	57	1128964
503	355	1128965
523	41	1128965
530	51	1128965
530	62	1128965
503	354	1128966
523	43	1128966
530	58	1128966
530	61	1128966
503	341	1128967
523	38	1128967
530	49	1128967
530	64	1128967
523	42	1128968
503	356	1128969
523	39	1128969
530	55	1128969
522	44	1128970
522	54	1128971
520	12	1128975
530	27	1128993
530	34	1128994

Code	Ref.	Part No.
530	48	1128995
530	47	1128997
504	19	1128999
519	11	1132000
519	7	1132003
519	10	1132007
524	124	1132009
524	175	1132012
524	173	1132013
525	14	1132019
524	140	1132021
524	132	1132027
501	69	1132028
522	39	1132029
535	40	1132030
517	59	1132042
502	51	1132051
502	43	1132052
526	31	1132055
502	24	1132056
510	8	1132064
510	89	1132064
510	93	1132064
518	2	1132064
529	10	1132065
529	15	1132066
529	7	1132067
530	67	1132068
510	28	1132069
511	11	1132074
511	32	1132078
516	54	1132080
511	2	1132084
517	60	1132088
524	103	1132092
516	48	1132097
511	24	1132098
518	9	1132098
519	33	1132098
519	36	1132098
502	58	1132100
503	213	1132102
516	55	1132103
511	19	1132117
508	160	1132118
508	263	1132118
511	94	1132122
516	135	1132122
525	34	1132122
522	74	1132123
535	34	1132126
535	35	1132127
531	6	1132147
508	153	1132148
503	26	1132149
525	41	1132149
503	3	1132150
503	99	1132154
529	14	1132157
520	66	1132158
520	60	1132161
520	62	1132162
520	67	1132164
503	245	1132165
517	78	1132165
503	244	1132166
520	54	1132173
525	10	1132181
525	12	1132183
531	4	1132185
503	201	1132186
503	231	1132191
535	11	1132200
535	110	1132200
518	11	1132204
503	41	1132211
508	16	1132212
516	134	1132212
526	84	1132214
526	120	1132218
526	159	1132218
526	68	1132219
526	164	1132219
526	76	1132220

Code	Ref.	Part No.
526	117	1132220
526	52	1132221
526	102	1132221
526	66	1132222
526	140	1132222
526	108	1132227
526	64	1132228
526	3	1132230
522	3	1132235
503	64	1132240
503	71	1132241
503	77	1132242
503	77	1132242
525	39	1132242
508	164	1132244
522	33	1132252
522	25	1132259
522	26	1132266
515	29	1132276
508	166	1132279
515	29	1132282
522	19	1132286
522	73	1132287
501	6	1132508
501	55	1132508
522	25	1133037
522	33	1133038
516	208	1133312
518	19	1133313
518	19	1133313
518	19	1133313
519	2	1133314
520	3	1133315
522	21	1133501
504	46	1133502
502	48	1133503
525	28	1133508
525	28	1133510
515	16	1133511
508	223	1133517
501	62	1133520
503	397	1133520
524	108	1133520
508	205	1133529
502	47	1133542
510	24	1133548
519	15	1133549
502	17	1133565
502	42	1133566
502	45	1133568
502	39	1133569
508	200	1133574
502	53	1133575
503	28	1133579
510	37	1133583
511	17	1133584
516	8	1133584
503	16	1133586
526	30	1133589
526	44	1133590
526	65	1133593
526	106	1133593
526	150	1133593
527	9	1133594
522	14	1133596
524	178	1133597
524	180	1133598
524	104	1133600
525	32	1133607
519	49	1133608
519	12	1133610
503	219	1133614
502	71	1133615
502	127	1133615
502	126	1133616
502	117	1133617
502	122	1133618
502	125	1133619
524	128	1133627
524	131	1133628
503	255	1133633
535	18	1133634
503	270	1133637
502	107	1133641

Code	Ref.	Part No.
503	236	1133647
501	120	1133649
503	220	1133649
503	241	1133654
508	212	1133658
503	149	1133659
503	150	1133659
508	202	1133659
508	152	1133660
525	52	1133661
502	46	1133662
520	41	1133663
526	20	1133665
526	147	1133665
520	26	1133667
502	100	1133668
520	28	1133668
502	52	1133669
503	21	1133670
517	64	1133671
522	34	1133672
503	238	1133679
519	4	1133681
503	237	1133682
503	242	1133683
522	28	1133685
518	17	1133686
517	65	1133687
501	121	1133713
522	120	1133746
520	3	1133807
525	42	1133807
516	106	1133808
516	208	1133809
522	26	1133810
522	26	1133810
518	19	1133811
518	19	1133811
516	151	1134635
533	76	1134635
517	27	1134708
517	70	1134709
517	68	1134710
516	220	1134711
511	25	1134712
501	43	1134741
508	222	1134765
503	76	1134767
503	22	1134768
526	70	1134773
526	121	1134773
526	160	1134773
503	4	1134784
508	207	1134785
508	32	1134803
502	10	1134810
502	36	1134811
503	66	1134812
503	67	1134813
502	10	1134816
502	36	1134817
501	40	1134818
503	214	1134820
503	215	1134821
501	50	1134822
531	14	1134823
517	61	1134824
501	57	1134825
501	59	1134826
501	52	1134827
501	72	1134829
516	13	1134829
516	113	1134829
522	7	1134829
524	105	1134829
524	115	1134829
524	177	1134829
525	73	1134829
526	73	1134829
526	113	1134829
526	151	1134829
503	24	1134831
507	55	1134831
502	74	1134837

Code	Ref.	Part No.
502	129	1134837
525	37	1134837
526	26	1134837
504	33	1134841
508	44	1134841
504	4	1134842
508	244	1134842
504	22	1134843
508	41	1134843
517	47	1134848
517	49	1134850
517	48	1134851
517	66	1134852
502	126	1134853
535	17	1134854
534	16	1134857
517	31	1134865
503	73	1134867
526	92	1134868
502	79	1134877
502	14	1134878
502	79	1134879
515	15	1134884
519	52	1134884
520	40	1134884
503	96	1134887
510	56	1134888
525	21	1134888
503	250	1134892
503	251	1134893
503	252	1134894
503	253	1134895
511	46	1134948
516	212	1134948
518	14	1134948
519	52	1134948
520	40	1134948
516	107	1134950
516	156	1134951
516	109	1134952
516	138	1134953
526	23	1134954
526	101	1134954
526	172	1134954
520	22	1134956
519	43	1134957
516	121	1134958
516	121	1134959
516	147	1134960
516	130	1134961
516	149	1134961
516	150	1134962
516	150	1134963
502	27	1134964
502	42	1134966
502	57	1134973
517	67	1134977
503	203	1134980
503	202	1134981
503	211	1134986
503	200	1134987
503	205	1134990
503	227	1134991
503	227	1134992
511	30	1134997
520	84	1135001
520	80	1135002
524	32	1135007
501	65	1135014
501	65	1135015
512	36	1135016
533	54	1135019
512	35	1135022
502	118	1135028
502	123	1135029
502	86	1135031
516	244	1135036
522	42	1135039
508	60	1135043
505	16	1135052
529	64	1135053
526	31	1135055
526	43	1135055
504	18	1135058

Code	Ref.	Part No.
501	52	1135061
527	1	1135065
534	38	1135068
504	5	1135076
504	14	1135079
525	18	1135082
525	6	1135083
510	51	1135084
525	20	1135084
534	23	1135086
524	24	1135089
515	2	1135093
503	27	1135096
503	2	1135097
504	17	1135099
533	52	1135100
535	51	1135102
535	51	1135103
535	50	1135104
535	50	1135106
535	50	1135107
535	10	1135117
535	8	1135118
534	9	1135121
503	42	1135124
503	54	1135125
503	49	1135127
503	56	1135128
503	51	1135129
503	45	1135130
503	50	1135130
524	9	1135130
507	12	1135134
512	26	1135134
523	34	1135134
530	52	1135134
507	11	1135135
507	25	1135136
534	22	1135137
534	23	1135144
531	12	1135163
531	13	1135164
520	10	1135167
503	16	1135168
512	31	1135169
511	38	1135173
504	95	1135175
504	96	1135177
504	105	1135177
504	97	1135178
504	100	1135179
504	106	1135180
524	145	1135183
527	30	1135192
512	1	1135193
527	42	1135194
516	58	1135195
516	42	1135204
511	56	1135211
520	81	1135212
533	60	1135216
506	27	1135217
535	51	1135221
535	51	1135222
535	50	1135226
517	31	1135229
510	49	1135233
524	72	1135234
524	22	1135235
513	2	1135237
516	247	1135241
534	23	1135244
535	42	1135248
535	112	1135248
535	64	1135251
535	69	1135252
535	66	1135253
535	68	1135254
535	65	1135255
535	67	1135256
535	70	1135257
535	60	1135259
535	60	1135260
535	63	1135261

Code	Ref.	Part No.
520	20	1135265
533	60	1135282
506	27	1135283
533	60	1135285
506	27	1135286
527	42	1135292
534	24	1135295
502	130	1135296
534	26	1135298
535	62	1135299
523	54	1135302
522	84	1135304
511	34	1135306
511	73	1135307
511	34	1135308
511	73	1135309
510	58	1135311
510	100	1135311
516	233	1135312
515	21	1135314
522	86	1135320
527	41	1135323
527	42	1135324
527	37	1135325
527	42	1135327
527	37	1135328
527	42	1135330
527	37	1135331
527	42	1135333
527	37	1135334
527	28	1135337
527	39	1135338
516	237	1135340
516	247	1135343
535	35	1135344
531	9	1135346
531	15	1135347
533	60	1135353
533	60	1135354
535	41	1135363
535	114	1135363
535	51	1135366
535	51	1135367
535	50	1135371
534	22	1135374
534	23	1135376
527	1	1135377
526	85	1135381
504	129	1135383
504	78	1135403
504	8	1135404
504	84	1135404
511	34	1135405
511	55	1135408
524	148	1135424
524	166	1135424
523	1	1135425
513	18	1135430
513	13	1135431
535	48	1135432
535	48	1135433
535	61	1135448
511	55	1135449
535	50	1135452
535	50	1135455
520	20	1135456
520	173	1135456
535	10	1135459
535	28	1135462
504	77	1135466
511	69	1135466
519	123	1135466
520	89	1135466
520	126	1135466
520	162	1135466
523	8	1135466
524	40	1135466
524	156	1135466
504	74	1135467
511	60	1135467
519	126	1135467
520	123	1135467
520	126	1135467
520	165	1135467

Code	Ref.	Part No.
523	5	1135467
523	8	1135467
504	80	1135474
511	70	1135474
520	90	1135474
504	75	1135476
511	61	1135476
520	93	1135479
511	65	1135482
513	15	1135487
513	16	1135488
513	9	1135489
513	11	1135490
535	45	1135491
535	132	1135491
503	97	1135493
508	5	1135494
503	207	1135495
524	7	1135496
524	2	1135497
524	11	1135498
524	3	1135505
524	56	1135506
524	57	1135507
524	55	1135508
524	60	1135511
504	56	1135512
506	30	1135513
527	1	1135570
506	28	1135573
523	55	1135573
524	185	1135573
507	26	1135575
504	39	1135576
504	15	1135583
504	43	1135583
524	1	1135584
508	35	1135590
508	14	1135591
531	5	1135592
530	42	1135593
531	58	1135593
535	14	1135594
535	70	1135597
535	66	1135598
535	60	1135599
522	31	1135604
503	103	1135605
516	214	1135617
504	41	1135619
523	65	1135621
522	64	1135639
506	31	1135643
530	70	1135643
519	41	1135676
519	45	1135677
523	53	1135696
511	55	1135704
524	5	1135713
524	116	1135714
535	152	1135739
535	152	1135740
527	37	1135751
527	37	1135753
527	42	1135754
527	42	1135755
527	42	1135756
527	42	1135757
527	42	1135758
527	42	1135759
527	42	1135760
527	42	1135761
527	42	1135762
527	42	1135763
527	42	1135764
527	42	1135765
527	42	1135766
527	42	1135767
527	42	1135768
526	123	1135780
527	21	1135780
533	60	1135787
506	27	1135788
502	98	1135826

Code	Ref.	Part No.
524	209	1135977
524	205	1135978
524	206	1135979
524	212	1135990
524	244	1135990
524	201	1135991
524	204	1135993
504	38	1135995
504	126	1135995
516	121	1138090
519	40	1138110
510	18	1138116
526	62	1138118
526	109	1138118
526	144	1138118
520	12	1138122
526	22	1138143
526	74	1138143
526	100	1138143
526	142	1138143
526	47	1138149
508	196	1138353
508	203	1138353
522	90	1138353
527	8	1138358
527	3	1138360
527	3	1138361
517	31	1145362
527	6	1138363
503	79	1138368
503	70	1138369
535	34	1138380
535	162	1138380
535	35	1138381
535	163	1138381
535	19	1138383
535	166	1138383
503	61	1138384
524	69	1138384
503	40	1138390
503	39	1138391
504	37	1138392
504	127	1138392
504	36	1138393
504	128	1138393
504	40	1138398
516	123	1138402
515	7	1138452
517	8	1138452
511	27	1138454
517	11	1138454
522	5	1138455
502	85	1138462
519	14	1138462
522	60	1138463
524	64	1138464
535	29	1138464
517	71	1138469
524	129	1138483
516	59	1138499
504	7	1138539
515	15	1138795
526	126	1138796
530	12	1138796
518	11	1138799
518	11	1138800
516	53	1138801
516	64	1138801
516	47	1138802
511	43	1138805
517	7	1138805
503	12	1138810
508	173	1138843
508	36	1138845
508	15	1138846
508	15	1138848
508	49	1138849
503	247	1138900
508	24	1141200
522	50	1141030
535	170	1141050
535	37	1141051
535	164	1141051
535	15	1141052
535	169	1141052
535	36	1141060
517	2	1141071
517	4	1141071
519	163	1141072
519	196	1141072
515	42	1141073
515	50	1141073
502	54	1141075
501	41	1141077
516	119	1141080
516	119	1141081
502	57	1141084
504	48	1141086
535	1	1141092
504	25	1141097
508	8	1141097
517	14	1141103
517	19	1141105
517	16	1141106
520	3	1141116
524	125	1141117
503	84	1141129
510	4	1141134
529	1	1141135
534	8	1141136
535	130	1141136
534	1	1141137
534	2	1141138
534	4	1141139
511	26	1141141
508	206	1141144
516	108	1141146
508	48	1141149
508	52	1141151
503	228	1141157
508	26	1141158
508	25	1141159
508	27	1141160
511	35	1141162
529	64	1141165
503	228	1141168
519	132	1141172
519	131	1141173
508	189	1141175
525	31	1141175
508	191	1141176
535	47	1141177
535	146	1141177
503	9	1141180
503	10	1141181
508	194	1141182
526	39	1141184
508	217	1141189
511	14	1141194
511	13	1141195
508	221	1141199
530	16	1141200
511	18	1141208
508	28	1141209
516	136	1141210
515	29	1141212
522	49	1141215
515	29	1141220
515	33	1141223
516	137	1141223
516	223	1141223
516	310	1141223
525	72	1141223
531	14	1141226
525	65	1141227
519	57	1141228
525	68	1141228
525	66	1141229
519	54	1141230
525	70	1141230
519	54	1141231
525	70	1141231
525	66	1141232
510	1	1141233
508	184	1141235
508	158	1141238
519	133	1141245
503	246	1141266
517	79	1141266
517	85	1141266
503	246	1141267
516	314	1141269
522	2	1141269
516	125	1141270
526	146	1141277
526	162	1141282
526	163	1141284
526	169	1141285
526	173	1141286
526	146	1141287
526	163	1141288
519	135	1141290
526	154	1141298
526	167	1141298
516	10	1141300
529	65	1141303
529	48	1141304
508	183	1141323
501	40	1141325
501	40	1141327
501	40	1141328
508	195	1141371
503	106	1141374
503	107	1141375
503	105	1141376
503	108	1141377
503	104	1141378
503	102	1141379
503	110	1141382
503	109	1141383
501	52	1141416
508	34	1141458
525	32	1141474
501	71	1141503
501	44	1141504
508	21	1141508
535	145	1141520
515	23	1141532
518	1	1141536
520	10	1141558
520	21	1141559
520	12	1141561
527	9	1141565
526	20	1141586
526	147	1141586
508	64	1141619
508	90	1141622
508	75	1141624
508	258	1141625
508	62	1141626
508	69	1141627
508	70	1141629
508	65	1141630
508	265	1141632
535	169	1141635
508	83	1141636
508	85	1141637
515	23	1141639
508	5	1141640
503	310	1141642
503	312	1141643
503	312	1141645
535	163	1141645
503	12	1141646
503	307	1141646
503	335	1141647
522	19	1141648
503	310	1141649
535	162	1141649
503	333	1141650
510	116	1141650
503	116	1141651
503	322	1141651
503	329	1141652
503	316	1141655
503	11	1141663
503	309	1141663
503	314	1141663
503	301	1141666
516	5	1141678
508	18	1141749
508	249	1141752
508	259	1141757
508	260	1141759
503	311	1141761
503	313	1141763
508	84	1141763
503	313	1141765
508	84	1141765
508	80	1141770
503	324	1141771
508	81	1141772
508	78	1141775
520	174	1141776
503	327	1141780
503	318	1141782
529	71	1141800
529	70	1141801
503	321	1141805
526	123	1141809
526	123	1141810
526	81	1141833
524	108	1141834
503	337	1141835
503	339	1141836
535	21	1141837
516	74	1141846
522	90	1141853
503	359	1141860
503	360	1141861
529	72	1141878
529	72	1141889
503	113	1141890
503	326	1141890
503	112	1141894
503	305	1141894
503	114	1141895
501	46	1141923
502	59	1141926
515	22	1141928
526	125	1141928
508	254	1141934
508	255	1141935
516	17	1141936
527	42	1141976
527	42	1141977
516	28	1141979
522	116	1141992
508	205	1141997
524	211	1142245
523	60	1142377
501	159	1143227
523	53	1143470
511	78	1143616
516	111	1144150
518	25	1144338
503	48	1144376
511	74	1144636
511	34	1144637
511	73	1144638
502	60	1144666
516	150	1144751
516	122	1144752
515	29	1144754
516	247	1144755
510	44	1144756
510	122	1144756
510	47	1144759
510	126	1144759
525	64	1144760
519	31	1144762
516	1	1144764
515	44	1144767
508	35	1144781
508	15	1144782
508	42	1144783
510	43	1144784
510	120	1144784
515	27	1144785
515	27	1144786
510	22	1144787
510	105	1144787
524	223	1144789
522	68	1144790
522	86	1144790
522	19	1144795
502	79	1144796
502	126	1144797
508	5	1144798
508	60	1144804
506	27	1144819
506	8	1144820
516	9	1144821
515	48	1144824
518	4	1144832
518	3	1144834
518	3	1144836
504	63	1144840
504	59	1144845
516	159	1144847
516	157	1144848
519	24	1144849
519	49	1144849
524	224	1144851
519	29	1144852
516	22	1144853
519	100	1144859
504	8	1144861
504	84	1144861
504	83	1144862
516	10	1144863
516	3	1144864
502	166	1144867
502	10	1144869
502	36	1144871
503	64	1144872
503	129	1144873
516	65	1144878
522	87	1144880
516	70	1144885
516	67	1144886
516	68	1144887
516	69	1144888
516	285	1144889
516	284	1144890
516	271	1144891
516	278	1144891
516	269	1144892
516	277	1144893
516	272	1144894
516	280	1144895
501	122	1144904
501	128	1144905
516	146	1144906
516	144	1144907
504	56	1144909
519	27	1144911
510	33	1144915
510	127	1144915
503	422	1144916
524	222	1144918
508	11	1144919
511	38	1144920
525	76	1144921
519	7	1144922
524	214	1144923
515	30	1144928
516	256	1144928
512	15	1144929
501	127	1144930
503	132	1144932
524	28	1144933
515	46	1144937
519	70	1144937
502	54	1144939
501	60	1144940
537	18	1144950
536	24	1144952
536	36	1144958
537	15	1144959
536	15	1144961
537	3	1144962
536	10	1144964
516	35	1144968
537	5	1144971
537	1	1144972
536	35	1144973
537	9	1144976
522	52	1144979
536	45	1144982

NUMERICAL INDEX

Code	Ref.	Part No.
536	20	1144983
536	25	1144984
536	37	1144984
536	38	1144985
536	16	1144986
536	6	1144988
516	37	1144989
536	22	1144989
537	17	1145340
511	55	1145356
516	4	1145359
531	7	1145359
504	58	1145360
501	125	1145361
517	75	1145363
503	136	1145364
504	5	1145384
524	217	1145385
502	10	1145387
523	54	1145388
510	53	1145390
510	49	1145391
510	98	1145391
508	61	1145395
508	61	1145396
516	216	1145408
516	215	1145409
515	23	1145410
512	36	1145414
507	26	1145415
516	154	1145422
516	141	1145423
516	24	1145424
516	273	1145438
516	267	1145442
516	276	1145443
525	63	1145446
522	100	1145451
511	34	1145453
511	76	1145468
512	36	1145475
517	10	1145478
516	2	1145479
519	30	1145479
536	27	1145487
508	75	1145490
511	57	1145491
519	198	1145495
535	35	1145513
524	57	1145515
516	57	1145516
522	113	1145519
508	64	1145522
504	63	1145523
508	80	1145525
504	59	1145526
508	24	1145528
504	5	1145533
535	37	1145537
508	3	1145543
536	50	1145564
513	53	1145581
513	51	1145582
513	46	1158353
530	11	1159004
530	46	1159007
530	23	1159008
530	10	1159009
530	22	1159010
530	1	1159014
530	28	1159015
530	19	1159016
530	47	1159017
530	48	1159020
530	59	1159021
530	63	1159023
530	68	1159024
530	1	1159026
530	23	1159027
530	59	1159028
516	245	1159045
524	229	1159052
524	233	1159053
533	14	1159077
524	212	1159083
504	24	1159097
508	43	1159097
522	38	1159109
523	62	1159112
524	203	1159119
511	4	1159125
511	8	1159126
524	114	1159129
501	45	1159132
501	46	1159135
525	6	1159149
505	24	1159155
502	135	1159157
530	72	1159167
503	121	1159171
503	126	1159173
501	10	1159175
503	125	1159182
503	124	1159185
520	4	1159193
516	253	1159194
516	250	1159198
516	250	1159199
516	62	1159201
516	218	1159202
516	257	1159203
516	252	1159204
516	249	1159205
516	264	1159206
516	259	1159207
516	258	1159208
516	260	1159209
516	260	1159210
501	119	1159211
501	48	1159212
526	15	1159220
516	264	1159234
524	183	1159239
511	84	1159240
524	181	1159241
511	83	1159244
511	85	1159246
522	107	1159262
510	5	1159267
510	86	1159267
510	9	1159269
510	90	1159269
524	243	1159278
519	20	1159286
519	138	1159286
519	152	1159286
519	195	1159286
524	241	1159286
527	1	1159295
519	20	1159298
527	1	1159299
511	90	1159301
511	87	1159306
511	86	1159307
511	93	1159308
511	56	1159312
519	151	1159321
515	16	1159325
519	155	1159327
519	156	1159334
519	172	1159335
519	184	1159335
519	161	1159336
515	18	1159338
515	307	1159339
502	167	1159341
502	108	1159346
508	42	1159350
525	6	1159352
527	1	1159353
533	60	1159356
506	27	1159357
533	12	1159358
519	4	1159362
524	204	1159363
515	2	1159367
515	16	1159369
519	191	1159372
519	190	1159374
515	55	1159375
524	246	1159388
524	242	1159390
522	74	1159409
530	70	1159420
529	37	1159430
524	184	1159443
527	1	1159455
519	193	1159479
516	312	1159483
518	10	1159485
516	309	1159489
535	163	1159490
516	304	1159491
516	303	1159492
519	180	1159493
516	311	1159494
504	78	1159496
511	34	1159498
511	34	1159499
523	14	1159506
529	58	1159507
508	49	1159508
533	60	1159514
533	60	1159515
533	11	1159516
511	81	1159536
501	48	1159537
523	1	1159542
524	248	1159544
507	25	1159545
507	25	1159546
527	5	1159549
535	138	1159553
535	138	1159554
535	131	1159556
535	131	1159557
519	117	1159558
535	126	1159559
535	126	1159560
535	135	1159561
535	122	1159562
535	116	1159565
535	115	1159567
535	160	1159568
535	159	1159569
535	158	1159570
535	160	1159571
535	159	1159572
535	158	1159573
526	102	1159574
526	102	1159575
535	155	1159577
535	155	1159578
535	101	1159579
535	156	1159579
535	156	1159580
535	156	1159581
535	156	1159582
535	127	1159584
535	127	1159585
535	127	1159586
519	101	1159589
535	151	1159593
535	139	1159594
535	140	1159595
535	140	1159596
535	147	1159597
535	147	1159598
535	107	1159599
535	103	1159624
535	100	1159625
535	113	1159626
535	111	1159627
535	107	1159628
535	103	1159629
535	100	1159630
535	103	1159631
535	108	1159632
535	124	1159633
535	124	1159634
535	104	1159635
535	54	1159636
501	2	1159637
535	160	1159638
535	159	1159639
535	101	1159643
535	101	1159646
535	101	1159647
503	361	1159650
535	123	1159651
535	123	1159652
510	118	1159654
507	43	1159660
503	114	1159662
510	114	1159674
507	52	1159716
512	8	1159716
523	53	1159721
535	157	1159751
535	154	1159752
535	101	1159753
535	157	1159754
535	154	1159755
535	101	1159756
535	157	1159757
535	154	1159758
535	101	1159759
535	157	1159760
535	154	1159761
535	101	1159762
504	107	1159775
501	18	1159779
501	18	1159779
501	10	1159780
501	14	1159781
522	93	1159782
502	174	1159787
502	173	1159790
501	16	1159791
522	113	1159799
519	158	1159818
512	43	1159829
512	46	1159832
512	42	1159833
512	41	1159834
512	44	1159835
512	47	1159841
512	45	1159842
510	60	1159843
510	102	1159843
510	62	1159844
510	104	1159844
503	312	1159867
510	57	1159878
510	13	1159886
510	95	1159886
503	349	1159891
503	347	1159893
503	348	1159894
502	139	1159898
508	60	1159905
508	60	1159908
503	312	1159936
513	58	1159937
513	44	1159938
510	74	1159939
510	133	1159939
513	50	1159940
513	45	1159941
511	111	1159942
512	48	1159945
511	108	1159947
510	72	1159948
510	131	1159948
511	107	1159949
511	112	1159950
513	49	1159951
511	109	1159952
513	40	1159953
511	102	1159954
510	73	1159955
510	132	1159955
513	42	1159956
513	43	1159957
512	50	1159958
513	51	1159959
511	105	1159960
513	53	1159961
513	56	1159963
510	70	1159964
510	129	1159964
510	75	1159965
510	134	1159965
513	47	1159966
513	48	1159967
522	42	1159969
533	52	1159970
507	41	1159972
507	44	1159973
507	51	1159974
507	50	1159975
507	48	1159978
507	49	1159982
512	40	1159992
504	3	1159993
504	1	1159994
504	1	1159995
504	2	1159996
504	2	1159998
522	132	1160256
503	344	1160777
523	55	1160777
533	80	1160976
533	72	1160983
504	94	1164027
515	52	1164027
516	124	1164027
516	219	1164027
516	221	1164027
516	263	1164027
508	240	1164039
508	205	1164041
508	250	1164044
502	117	1164045
502	126	1164047
502	117	1164048
502	126	1164048
517	76	1164086
502	71	1164089
502	127	1164089
508	235	1164099
535	149	1164100
519	140	1164105
520	30	1164127
520	37	1164127
520	58	1164127
508	210	1164151
508	30	1164153
508	233	1164158
525	93	1164158
526	87	1164160
519	63	1164171
508	79	1164218
529	75	1164220
529	83	1164236
529	74	1164237
529	85	1164239
508	48	1164240
529	79	1164240
529	73	1164241
508	60	1164254
508	199	1164285
516	153	1164289
508	66	1164290
501	52	1164308
501	52	1164309
508	234	1164310
502	10	1164314
502	10	1164316
516	9	1164342
535	141	1164373
526	42	1164380
526	1	1164381
503	322	1164394
524	174	1164433
508	94	1164435
527	5	1164462
527	5	1164463
527	7	1164476
526	88	1164499

Code	Ref.	Part No.
526	88	1164542
508	163	1164548
508	242	1164550
511	114	1164556
516	73	1164561
508	93	1164562
508	191	1164563
501	1	1164576
501	51	1164576
502	55	1164576
503	80	1164576
503	101	1164576
503	111	1164576
503	130	1164576
503	232	1164576
503	234	1164576
503	240	1164576
511	37	1164576
513	3	1164576
516	112	1164576
516	133	1164576
516	232	1164576
516	313	1164576
517	17	1164576
519	3	1164576
519	58	1164576
520	23	1164576
522	22	1164576
522	53	1164576
522	62	1164576
522	81	1164576
522	91	1164576
523	28	1164576
523	31	1164576
525	15	1164576
525	67	1164576
533	7	1164576
535	13	1164576
535	31	1164576
535	109	1164576
535	153	1164576
501	56	1164577
501	154	1164577
503	117	1164577
503	306	1164577
504	25	1164577
504	58	1164577
504	98	1164577
505	21	1164577
507	6	1164577
510	16	1164577
510	54	1164577
510	99	1164577
511	29	1164577
511	75	1164577
512	12	1164577
516	140	1164577
526	82	1164577
533	79	1164577
502	88	1164578
503	145	1164578
503	317	1164578
503	340	1164578
503	351	1164578
511	15	1164578
511	16	1164578
512	25	1164578
512	30	1164578
513	6	1164578
513	55	1164578
516	120	1164578
522	109	1164578
523	35	1164578
523	36	1164578
524	123	1164578
525	23	1164578
529	40	1164578
530	50	1164578
530	60	1164578
501	123	1164579
503	229	1164579
503	239	1164579
516	7	1164579
516	74	1164579

Code	Ref.	Part No.
520	82	1164579
520	167	1164579
524	200	1164579
526	80	1164579
535	109	1164579
535	136	1164579
502	89	1164580
503	217	1164580
504	7	1164580
508	74	1164580
508	159	1164580
508	172	1164580
508	237	1164580
508	262	1164580
508	264	1164580
513	5	1164580
516	23	1164580
516	242	1164580
517	62	1164580
529	4	1164580
529	76	1164580
530	6	1164580
530	21	1164580
530	36	1164580
535	20	1164580
535	25	1164580
535	30	1164580
535	167	1164580
503	94	1164582
503	98	1164582
503	146	1164582
506	26	1164582
507	17	1164582
508	87	1164582
510	3	1164582
510	17	1164582
511	15	1164582
512	14	1164582
513	57	1164582
515	38	1164582
516	217	1164582
519	56	1164582
519	122	1164582
520	33	1164582
520	63	1164582
522	23	1164582
524	10	1164582
524	53	1164582
524	225	1164582
525	60	1164582
535	144	1164582
503	224	1164583
503	226	1164583
522	66	1164584
522	131	1164584
524	141	1164584
524	207	1164584
529	64	1164600
503	71	1164601
525	90	1164619
503	365	1164652
511	113	1164720
508	15	1164736
508	15	1164738
508	38	1164739
508	19	1164740
508	36	1164740
502	11	1164775
519	134	1164799
520	3	1164859
508	193	1164879
502	78	1166001
522	113	1166003
535	143	1166033
535	150	1166034
533	11	1166036
533	74	1166036
535	127	1166037
535	164	1166040
511	36	1166041
513	59	1166042
505	28	1166054
529	38	1166063
520	20	1166071

Code	Ref.	Part No.
501	5	1166082
501	5	1166083
507	40	1166088
516	136	1166089
535	175	1166099
508	49	1166102
533	71	1166114
533	67	1166115
508	88	1166164
523	29	1166165
520	29	1166186
507	46	1166187
535	32	1166191
535	52	1166191
507	54	1166203
519	164	1166212
519	166	1166214
519	192	1166214
510	7	1166217
510	88	1166217
510	110	1166230
510	109	1166231
516	238	1166301
512	6	1166304
511	101	1166307
510	76	1166309
504	28	1166311
504	30	1166315
533	60	1166328
504	120	1166339
504	121	1166341
504	122	1166342
533	73	1166358
522	134	1166362
522	125	1166363
504	133	1166364
510	105	1166365
510	105	1166366
522	128	1166368
522	135	1166369
522	122	1166370
522	128	1166371
510	80	1166372
510	82	1166373
522	129	1166375
522	124	1166380
522	133	1166381
510	97	1166382
510	96	1166383
522	126	1166384
522	126	1166385
510	83	1166387
510	84	1166388
516	22	1166414
519	29	1166414
519	29	1166415
516	22	1166416
533	68	1166498
504	125	1166551
504	124	1166553
504	131	1166554
510	124	1166555
522	121	1166557
504	132	1166558
510	96	1166559
502	176	1166560
504	123	1166575
504	29	1166598
508	224	1167010
508	224	1167015
508	224	1167019
508	224	1167050
508	224	1167856
508	224	1167901
508	224	1167902
508	224	1167903
508	224	1167904
508	224	1167905
508	224	1167907
508	224	1167908
508	224	1167909
508	224	1167910
508	224	1167912
508	224	1167913

Code	Ref.	Part No.
508	224	1167914
508	224	1167916
508	224	1167938
508	224	1167939
508	224	1167940
508	224	1167941
508	224	1167942
508	224	1167943
508	224	1167947
508	224	1167948
508	224	1167950
508	224	1167961
508	224	1167962
508	224	1167963
508	224	1167967
508	224	1167968
533	70	1176511
520	166	1176514
531	9	1176515
501	168	1176516
501	52	1176653
501	52	1176734
501	52	1176778
503	411	1176813
503	391	1176814
503	392	1176815
503	393	1176816
503	412	1176821
503	410	1176823
503	401	1176824
508	89	1176826
508	65	1176827
503	420	1176828
503	413	1176829
503	387	1176830
503	403	1176831
503	383	1176832
503	381	1176834
503	381	1176835
503	381	1176836
503	381	1176837
503	381	1176838
503	381	1176839
503	395	1176841
522	105	1176842
523	61	1176843
523	67	1176844
503	256	1176845
524	32	1176847
524	31	1176848
526	95	1176853
526	93	1176855
535	53	1176857
503	300	1176858
531	15	1176859
531	9	1176860
517	80	1176863
503	402	1176864
524	212	1176865
503	339	1176868
503	236	1176871
522	112	1176872
503	142	1176876
503	143	1176879
522	110	1176882
503	144	1176884
522	108	1176884
522	111	1176885
503	141	1176886
503	148	1176887
501	167	1176891
501	166	1176892
501	65	1176895
501	151	1176895
501	152	1176896
501	153	1176897
501	165	1176898
501	156	1176899
523	77	1176900
523	75	1176901
503	110	1176902
531	13	1176904
517	14	1176906
517	86	1176906

Code	Ref.	Part No.
501	161	1176910
520	169	1176913
517	87	1176914
517	81	1176920
503	237	1176922
503	386	1176925
503	394	1176926
503	416	1176927
503	382	1176928
533	69	1176929
506	27	1176932
527	53	1176934
527	54	1176935
503	390	1176939
535	101	1176943
535	47	1176945
535	146	1176945
513	59	1176947
519	104	1176949
535	157	1176950
535	154	1176951
523	71	1176975
535	47	1176988
535	146	1176988
522	123	1176990
517	84	1176998
501	19	1260156
524	151	1261967
523	15	1262776
523	15	1262777
523	20	1262778
523	20	1262779
523	14	1262780
530	33	1262789
513	28	1262790
501	4	1263006
516	136	1266171
508	201	1266687
504	49	1266830
517	13	1266879
524	24	1266892
523	45	1266893
530	57	1266893
507	12	1266894
512	26	1266894
523	34	1266894
530	52	1266894
512	35	1266895
507	25	1266897
526	103	1271548
526	103	1271549
517	52	1271552
526	38	1271741
516	72	1271973
520	170	1271988
530	71	1272005
530	71	1272006
530	71	1272007
530	71	1272008
501	73	1272045
533	13	1272062
527	50	1272076
527	50	1272078
524	239	1272121
524	239	1272122
523	54	1272125
503	139	1272132
508	256	1272176
515	53	1272185
516	291	1272187
516	291	1272188
516	291	1272189
515	29	1272222
515	29	1272223
535	173	1272437
501	138	1272458
535	173	1272460
515	41	1272464
501	135	1272655
527	52	1272659
527	12	1272660
527	52	1272661
510	63	1272675
510	64	1272677

NUMERICAL INDEX

Code	Ref.	Part No.
510	135	1272677
503	364	1272709
520	171	1272719
535	173	1272779
535	173	1272780
535	173	1272781
535	173	1272782
535	173	1272783
535	173	1272784
535	173	1272785
535	173	1272786
535	173	1272787
535	173	1272788
535	173	1272789
535	173	1272790
501	135	1272824
510	64	1272915
510	135	1272915
517	88	1272939
517	75	1272940
527	12	1273657
515	53	1276137
516	296	1276145
510	50	1276250
537	2	1280060
516	71	1280081
508	241	1280119
530	66	1280358
508	253	1280498
504	55	1280821
504	55	1280822
525	27	2101794
524	230	2106517
533	61	2108398
508	72	2114985
508	182	2114985
516	281	2114985
533	10	2122258
533	2	2122259
533	10	2122260
533	2	2122261
533	12	2122471
533	13	2122472
533	3	2122628
533	6	2122734
533	4	2122735
533	5	2123029
533	1	2127859
501	157	5319912
533	66	5352967
533	64	5800610

I/O Printer

I/O Printer

Fold

Use clear acetate tab obtained locally

Cut

124-0054-3

IBM Selectric I/O Keyboard Printer Printed in U.S.A. 124-0054-3

International Business Machines Corporation

Field Engineering Division

112 East Post Road White Plains N. Y. 10601

2740 / 2741 Communications Terminals

IBM® Parts Catalog

PREFACE

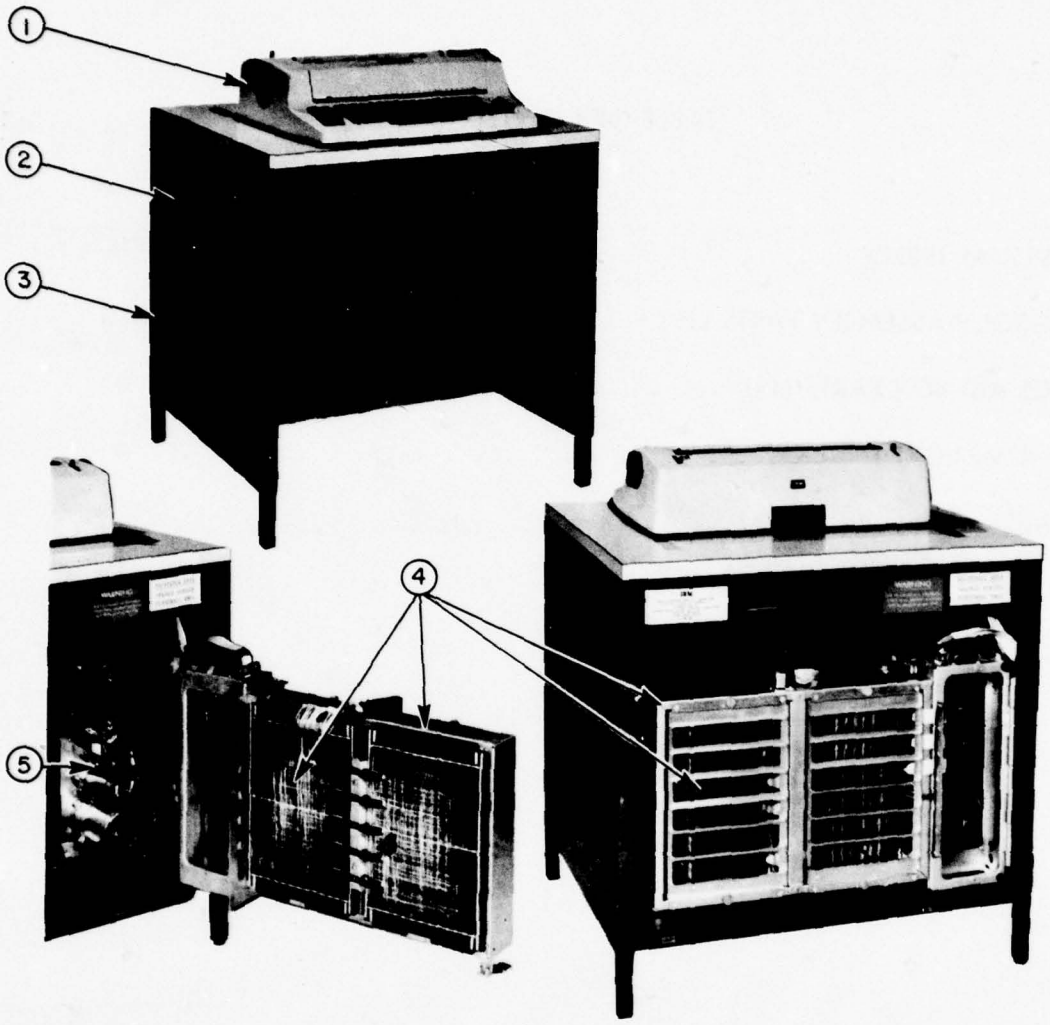
This Illustrated Parts Catalog (IPC) contains listings and illustrations of all replaceable assemblies, subassemblies and detail parts released to Production Control on or before October 1, 1965 for the 2740/2741 Communications Terminals.

Copies of this and other IBM publications can be obtained through IBM Branch Offices.
Address comments concerning the contents of this publication to:
IBM Corporation, Field Engineering Division, Dept. 918, Lexington, Kentucky, 40507

TABLE OF CONTENTS

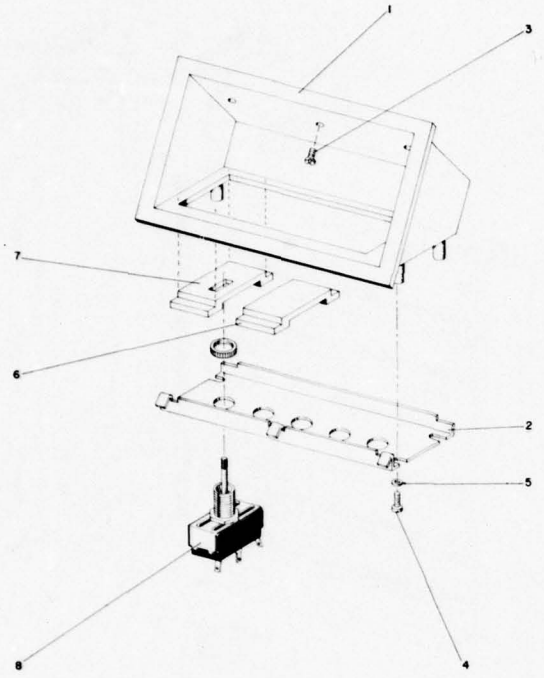
	Page
VISUAL INDEX	II
GROUP ASSEMBLY PARTS LIST	1-3
CE AID BOX PARTS LIST	3
NUMERICAL INDEX	4

IPC
VISUAL INDEX



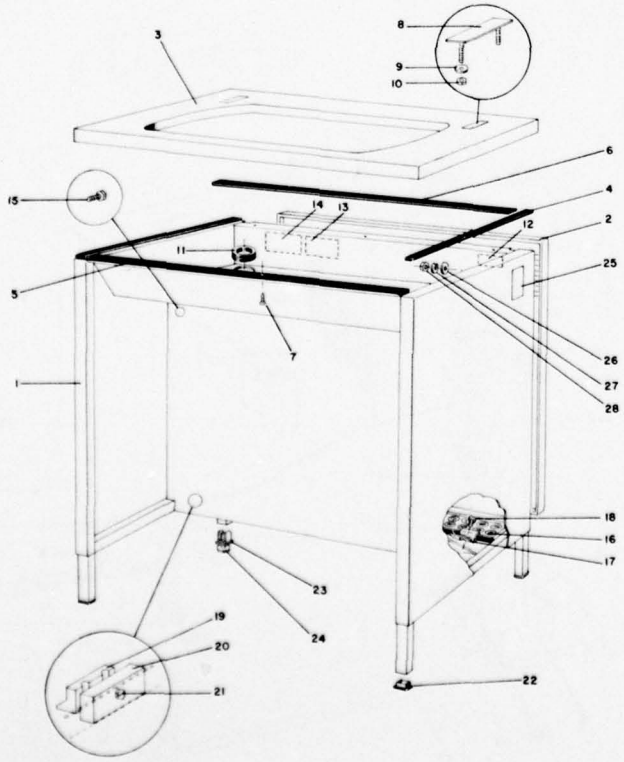
INDEX NO.	DESCRIPTION	REFER TO	PAGE
1	I/O Keyboard Printer	IPC Form 124-0054	-
2	Switch Assembly	Figure 1	1
3	Typewriter Stand Assembly.	Figure 2	1
4	Electronic Gate and SLT Board Assembly. . .	Figure 3, 4	2
5	Power Supply Assembly	Figure 5	3

FIG. 1 SWITCH ASM.



REF	P/N	DESCRIPTION	REF	P/N	DESCRIPTION
1	1176722	FRAME, SWITCH			
2	1176723	BRACKET, SWITCH			
3	81693	SCREW			
4	1164576	SCREW			
5	257986	WASHER			
6	1176789	FILLER, SWITCH PLATE			
7	1176116	CAP, SWITCH COMM LOCAL-2741			
7	1176782	CAP,SWITCH,MC-2740			
7	1176783	CAP,SWITCH,TC-2740			
7	1176784	CAP,SWITCH,CHKING			
8	725347	SWITCH, COMM-LOCAL 2741			
8	734878	SWITCH,CHECKING,TC AND MC			

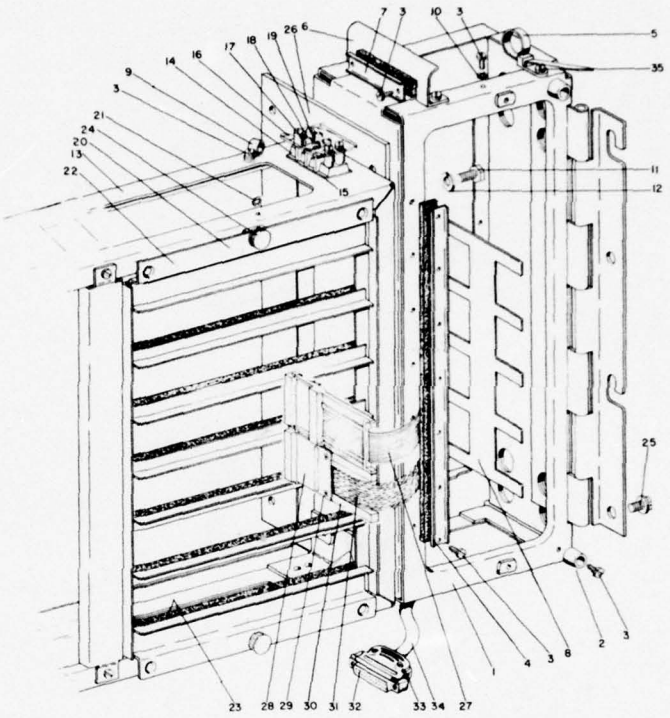
FIG. 2 TYPEWRITER STAND ASM.



REF	P/N	DESCRIPTION	REF	P/N	DESCRIPTION
1	1176755	STAND, TYPEWRITER			
2	1176765	COVER, REAR			
3	1176760	BOARD, READING			
4	1176753	SPACER, SIDE			
5	1176751	SPACER, FRONT			
6	1176752	SPACER, REAR			
7	1176764	SCREW, READING BRD			
8	1176749	STRIP, FILLER			
9	1071644	WASHER,FILLER STRP			
10	257189	NUT, FILLER STRIP			
11	334663	GROMMET, CABLE			
12	1176772	PLATE, PATENT ID 115VAC, 60C			
12	1176773	PLATE, PATENT ID 195-235VAC,50C-WTC			
13	461017	DECAL, SAFETY			
14	369208	DECAL, SAFETY			
15	602607	SCREW,POWER SUPPLY			
16	1176756	FILTER, AIR			
17	1176754	CLAMP, FILTER			
18	332620	SCREW, FILTER			
19	1176757	CLAMP, CABLE EXIT			
20	1176737	SPACER, EXIT CABLE CLAMP			
21	322034	SCREW			
22	1176761	FOOT			
23	1176758	INSERT, FOOT			
24	1176759	FOOT, ADJUSTABLE			
25	1176674	PLATE			
26	2902	WASHER, FLAT			
27	6364	LOCKWASHER			
28	257187	NUT			

REF	P/N	DESCRIPTION
1	1176740	EXTENSION, GATE
2	316771	FOOT, GATE BUMPER
3	731626	SCREW
4	1176733	CLAMP A,MULT CABLE
5	1159255	CLAMP, CABLE
6	1176703	BRKT, CABLE CLAMP
7	1176707	CLAMP A, PTR CABLE
8	1176736	RETAINER,GT CABLES
9	2102365	CLAMP, BUSS CABLE
10	56722	WASHER, GROUND
11	38686	SCREW, ELEC GATE
12	6935	WASHER, ELEC GATE
13	1176735	GATE, ELECTRONIC
14	323836	BLOCK, 2 POS TERM
15	331655	INSULATOR, 2 POS TERMINAL
16	187854	SHIELD, SAFETY
17	210884	STUD, TERM BLOCK
18	210883	STUD, TERM BLOCK
19	210984	SCREW, BRASS
20	1176747	COVER A, CARD
	CARD COVER A COMPONENTS-REF 21-24	
21	1092125	RING, RETAINING
22	1176706	COVER, CARD
23	1176766	CUSHION
24	1176748	SCREW, THUMB
25	602607	SCREW, HINGE MTG
26	1176720	PLATE, DIVIDER
27	1176929	CABLE A,BD TO PRTR
28	5800610	CARD ASSEMBLY
29	595720	RIVET
30	5352967	RELIEF, STRAIN
31	1176745	CABLE A, DATA SET INCL REF 28-30, AND 32-34
32	765294	CONNECTOR
33	765295	HOOD & STRAIN RELIEF ASSEMBLY
34	1176744	CABLE, 12 FT, 15 CONDUCTOR
35	1164576	SCREW

FIG. 3 ELECTRONIC GATE & SLT BOARD ASM.



REF	P/N	DESCRIPTION
1	1176789	BRACKET,GATE LATCH
2	1176726	LATCH, GATE
3	731626	SCREW
4	1176746	CABLE A, CE AID
	CABLE A COMPONENTS-REF 5-10	
4	1176792	CABLE A, CE AID
	CABLE A COMPONENTS-REF 8-14 7-ROW BOARD	
5	813195	TERMINAL, CLIP-ON
6	813197	HOUSING, CONNECTOR
7	1176729	MOUNT, CE AID
7	1176791	MOUNT, CE AID-USE WITH 7-ROW BOARD
8	3759776	SOCKET, CRNR GUIDE
9	2122257	CONNECTOR
10	2127867	TERMINAL PIN
11	5800610	CARD ASSEMBLY
12	595720	RIVET
13	5352967	RELIEF, STRAIN
14	813179	CLAMP, BOARD
15	811417	SCREW, BOARD
16	1176728	HOUSING, BUSS BAR
17	438568	SCREW,BUSS HOUSING
18	1176727	COVER, BUSS BAR HOUSING
19	811562	RETAINER,FLAT SPRG
20	1164576	SCREW
21	1176741	BAR A, BASE BUSS
	BUSS BAR A COMPONENTS-REF 23-25	
22	1176739	CONN CBM, VOLTAGE
23	1176738	BAR, BUSS
24	334910	TERMINAL
25	1176762	BAR A,FEATURE BUSS
	BUSS BAR A COMPONENTS-REF 23-25	
26	1176090	BOARD, SLT-6 ROW
26	1176096	BOARD, BASE SLT-7 ROW-DOM 2740
26	1176100	BOARD, BASE SLT 7 ROW-WTC 2740
26	1176200	BOARD, BASE SLT 7 ROW-2741 ONLY
27	1176088	BOARD,FEATURE SLT 6 ROW
27	1176094	BOARD,FEATURE SLT 7 ROW-DOM
27	1176090	BOARD,FEATURE SLT 7 ROW-WTC
28	1176788	JUMPER, INTER GATE LONG
28	5802216	JUMPER, INTER GATE SHORT
29	811600	CAPACITOR,DECPLING
30	580XXXX	CARD,SLT-LAST FOUR DIGITS OF PN ARE STAMPED ON CD ASM
30	811824	JUMPER ASSEMBLY-USED ON ADDR CARDS

FIG. 4 ELECTRONIC GATE & SLT BOARD ASM.

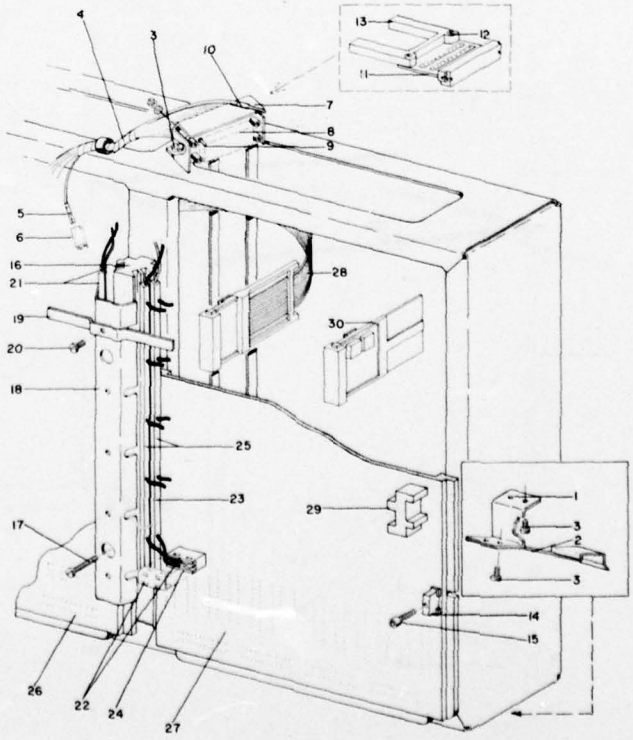
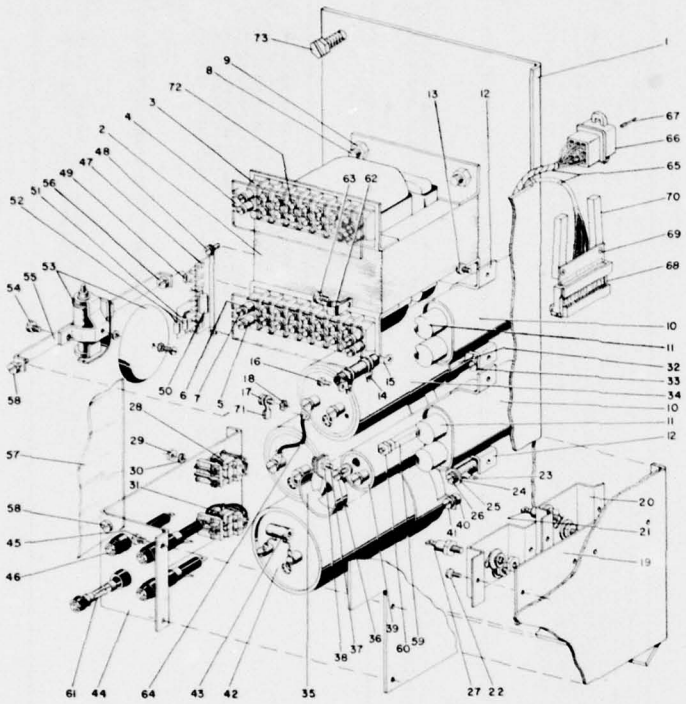
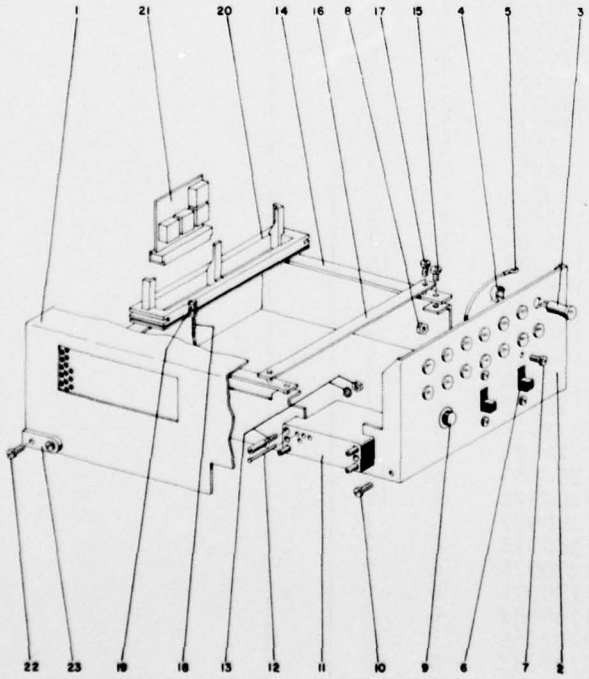


FIG. 5 POWER SUPPLY ASM.



REF	P/N	DESCRIPTION
	1176694	POWER SUPPLY ASSEMBLY 115VAC, 60C
	1276695	POWER SUPPLY ASSEMBLY-WTC 50C
1	1176715	PLATE,POWER SUPPLY
2	1176777	REGULATOR,115V,60C INCLUDES REF 3-7
2	1176742	REGULATOR,220V,50C WTC-INCL REF 3-7
2	1176654	REGULATOR,208/230V 60C-INCL REF 3-7
3	320606	TERMINAL, STRIP
4	191479	SHIELD
5	210986	STUD
6	210985	STUD
7	210984	SCREW
8	36844	SCREW, TRANSF MTG
9	336766	NUT, TRANSF MTG
10	1176776	CAP,6MFD,330VAC
10	1176743	CAP,7.5MFD,330VAC WTC
11	526378	CAP, INSULATING
12	526344	CLAMP, CAPACITOR
13	186759	SCREW, CAP CLAMP
14	482383	RESISTOR, 30 OHM, 10W
15	1176718	BRACKET, RESISTOR
16	38350	SCREW,RESISTOR BKT
17	1164576	SCREW, GND
18	56722	LKWASHER, GROUND
19	1176716	INSULATOR,HEATSINK
20	1143263	HEATSINK,RECTIFIER
21	337507	RECTIFIER, PL, 12V
22	350884	SCREW,HEATSINK MTG
23	472586	RESISTOR
24	442959	WASHER, INSULATOR
25	257986	WASHER, RESISTOR
26	438569	SCREW, RESISTOR
27	337512	RECTIFIER, PL, 48V
28	587254	RELAY, 115V
29	257187	NUT
30	6364	LKWASHER
31	754606	RELAY, 12V
32	1176717	CLAMP, CAPACITOR
33	1164576	SCREW, CAP CLAMP
34	1176712	CAPACITOR,31000MFD
35	445304	CLAMP, CAPACITOR
36	1164576	SCREW, CAP CLAMP
37	322065	SCREW, CAP CLAMP
38	257187	NUT, CAP CLAMP
REF	37,38-USED ON ALL CAP BASE CLAMPS	
39	441174	CAPACITOR, 5000MFD
40	1108649	SPACER, CAP MTG
41	35739	SCREW, CAPACITOR
42	140470	CAPACITOR, 8000MFD
43	315891	RESISTOR, 1K, 5W
44	1176719	BRACKET, FUSE
45	38350	SCREW,FUSE BRACKET
46	179946	FUSEHOLDER
47	317199	STRIP, TERMINAL
48	38350	SCREW, TERM BOARD
49	2106333	DIODE
50	317084	RESISTOR, 1.5K, 2W
51	2122897	TUBING, DIODE
52	5323537	RECTIFIER
53	1176711	BELL, SIGNAL
53	1176794	BELL, SIGNAL-USED WITH STATION CTRL FEATURE,BRACKET PN 1176793, SCREW PN 731626.
54	58207	SCREW, BELL MTG
55	1176713	POST, BELL SUPPORT
56	186759	SCREW,BELL BRACKET
57	1176709	SHIELD, CAPACITOR
58	186759	SCREW, CAP SHIELD
59	1176714	POST, CAP SHIELD
60	257189	NUT, CAP CLAMP
61	361755	FUSE, 2.5A
61	3344	FUSE, 2.0A
61	111257	FUSE, 4.0A
61	3577	FUSE, 0.5A
62	1159255	CLAMP, CABLE
63	1164576	SCREW, CABLE CLAMP
64	2114103	JUMPER, CAPACITOR
65	1176721	CABLE A, PS TO CST TERMINAL CONNECTOR DETAIL PARTS
66	1166499	HOUSING, PIN TERM
67	1166114	PIN, TERMINAL
68	5800610	CARD ASSEMBLY
69	595720	RIVET
70	5352967	RELIEF, STRAIN
71	359695	TERMINAL,RING,BLUE
71	334932	TERMINAL,RING,RED
72	55726	SCREW
73	602607	SCREW,POWER SUPPLY

FIG. 6 CE AID BOX



REF	P/N	DESCRIPTION
	1272825	BOX ASM, CE AID
1	1280972	COVER ASM, TOP
2	1280973	COVER, BASE
3	1280982	LAMP
4	1133593	RETAINER, LAMP
5	368169	CLIP, SLIP-ON
6	1280976	SWITCH, SLIDE
7	438548	SCREW, SWITCH MTG
8	37913	NUT, SWITCH MTG
9	1280975	SWITCH, PUSHBUTTON
10	1164582	SCREW, COVER
11	2122256	CONN, AMP, 34 PIN, FEMALE
12	2127890	SOCKET, CRIMP
13	3759777	PIN ASM, GUIDE
14	1280969	BRACKET, SOCKET
15	55726	SCREW, SOCKET BRKT MOUNTING
16	1280970	RETAINER, CARD
17	438548	SCREW,RETAINER MTG
18	813195	CONN, CBM DISCRETE
19	813197	HOUSING, DISCRETE WIRE CONNECTOR
20	813329	INTERFACE,CARD ASM
21	580xxxx	CARD,SLT-LAST FOUR DIGITS OF PN ARE STAMPED ON CD ASM
22	734483	SCREW, SLIDE MTG
23	1176664	SLIDE, LOCATING

NUMERICAL INDEX

PART NO.	FIG. NO.	LIST NO.
2902	2	26
3344	5	61
3577	5	61
6364	2	27
6364	5	30
6935	3	12
35739	5	41
36844	5	8
37913	6	8
38350	5	16
38350	5	45
38350	5	48
38686	3	11
55726	5	72
55726	6	15
56722	3	10
56722	5	18
58207	5	54
81693	1	3
111257	5	61
140470	5	42
179946	5	46
186759	5	13
186759	5	56
186759	5	58
187854	3	16
191479	5	4
210883	3	18
210884	3	17
210984	3	19
210984	5	7
210985	5	6
210986	5	5
257187	2	28
257187	5	29
257187	5	38
257189	2	10
257189	5	60
257986	1	5
257986	5	25
315891	5	43
316771	3	2
317084	5	50
317199	5	47
320606	5	3
322034	2	21
322065	5	37
323836	3	14
331655	3	15
332620	2	18
334663	2	11
334910	4	24
334932	5	71
336766	5	9
337507	5	21
337512	5	27
350884	5	22
359695	5	71
361755	5	61
368169	6	5
369208	2	14
438548	6	7
438548	6	17
438568	4	17
438569	5	26
441174	5	39
442959	5	24
445304	5	35

PART NO.	FIG. NO.	LIST NO.
461017	2	13
472586	5	23
482383	5	14
526344	5	12
526378	5	11
587254	5	28
595720	3	29
595720	4	12
595720	5	69
602607	2	15
602607	3	25
602607	5	73
725347	1	8
731626	3	3
731626	4	3
734483	6	22
734878	1	8
754606	5	31
765294	3	32
765295	3	33
811417	4	15
811562	4	19
811600	4	29
811824	4	30
813179	4	14
813195	4	5
813195	6	18
813197	4	6
813197	6	19
813329	6	20
1071644	2	9
1092125	3	21
1108649	5	40
1133593	6	4
1143263	5	20
1159255	3	5
1159255	5	62
1164576	1	4
1164576	3	35
1164576	4	20
1164576	5	17
1164576	5	33
1164576	5	36
1164576	5	63
1164582	6	10
1166114	5	67
1166499	5	66
1176088	4	27
1176090	4	26
1176094	4	27
1176096	4	26
1176098	4	27
1176100	4	26
1176116	1	7
1176200	4	26
1176654	5	2
1176664	6	23
1176674	2	25
1176694	5	
1176703	3	6
1176706	3	22
1176707	3	7
1176709	5	57
1176711	5	53
1176712	5	34
1176713	5	55
1176714	5	59
1176715	5	1

PART NO.	FIG. NO.	LIST NO.
1176716	5	19
1176717	5	32
1176718	5	15
1176719	5	44
1176720	3	26
1176721	5	65
1176722	1	1
1176723	1	2
1176726	4	2
1176727	4	18
1176728	4	16
1176729	4	7
1176733	3	4
1176735	3	13
1176736	3	8
1176737	2	20
1176738	4	23
1176739	4	22
1176740	3	1
1176741	4	21
1176742	5	2
1176743	5	10
1176744	3	34
1176745	3	31
1176746	4	4
1176747	3	20
1176748	3	24
1176749	2	8
1176751	2	5
1176752	2	6
1176753	2	4
1176754	2	17
1176755	2	1
1176756	2	16
1176757	2	19
1176758	2	23
1176759	2	24
1176760	2	3
1176761	2	22
1176762	4	25
1176764	2	7
1176765	2	2
1176766	3	23
1176772	2	12
1176773	2	12
1176776	5	10
1176777	5	2
1176782	1	7
1176783	1	7
1176784	1	7
1176788	4	28
1176789	1	6
1176789	4	1
1176791	4	7
1176792	4	4
1176794	5	53
1176929	3	27
1272825	6	
1276695	5	
1280969	6	14
1280970	6	16
1280972	6	1
1280973	6	2
1280975	6	9
1280976	6	6
1280982	6	3
2102365	3	9
2106333	5	49

PART NO.	FIG. NO.	LIST NO.
2114103	5	64
2122256	6	11
2122257	4	9
2122897	5	51
2127867	4	10
2127890	6	12
3759776	4	8
3759777	6	13
5323537	5	52
5352967	3	30
5352967	4	13
5352967	5	70
580XXXX	4	30
580XXXX	6	21
5800610	3	28
5800610	4	11
5800610	5	68
5802216	4	28

IBM 2740 2741

Unpacking/Packing Instructions

DO NOT UNPACK THIS MACHINE UNTIL AN IBM CUSTOMER ENGINEER IS PRESENT.

Field unpacking or packing of the machine must be accomplished by experienced personnel under the direction of the Customer Engineer.

CHECK AND MAKE NOTE OF ANY DAMAGE TO MACHINE. If severe damage is discovered, contact your manager before continuing installation. Photographs should be considered, showing damage, to facilitate further investigation by the plant of manufacture.

Instruction Part No. 7340967		
E.C. No. 505333		Date 12-27-65
Revision No.		
C.E. Approved J.G.L		1/10/66
Draw TJH	Check LHB	Approved DJL

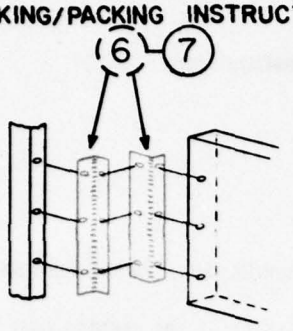
STORE OR DISPOSE OF PACKAGING MATERIAL LOCALLY UNLESS OTHERWISE NOTED IN UNPACKING INSTRUCTIONS.

FILE THESE INSTRUCTIONS WITH THE SYSTEMS INSTALLATION MANUAL.

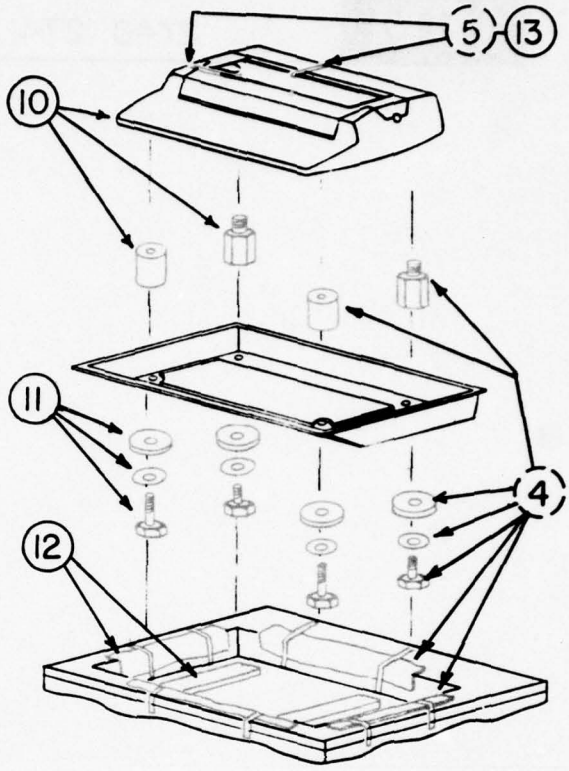
Printed In U. S. A.

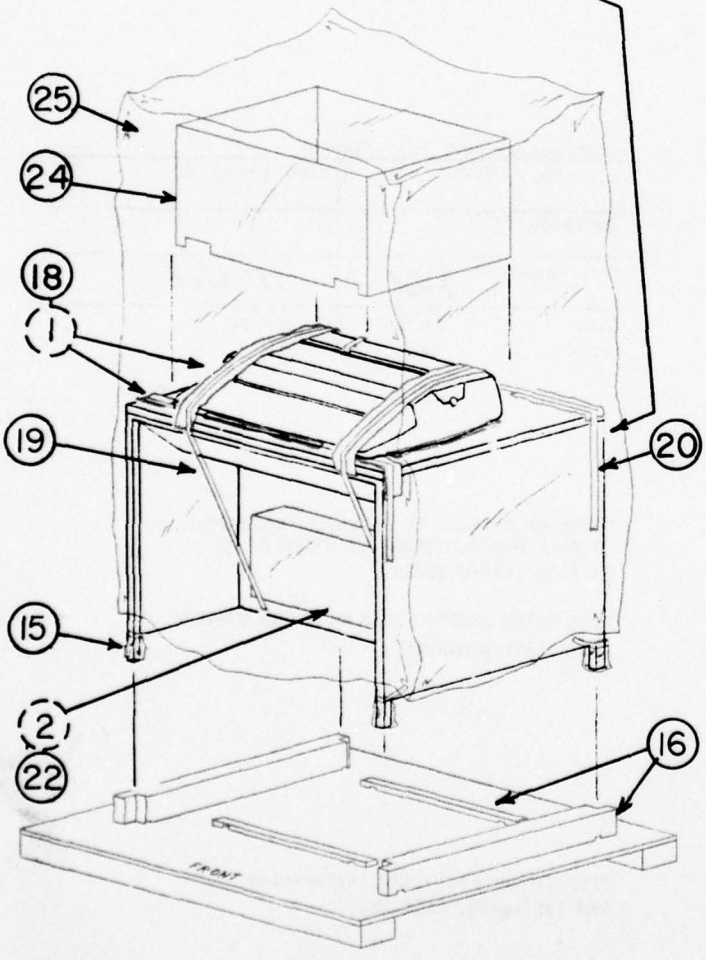
Prepared by Packaging Engineering
IBM Lexington, Kentucky

UNPACKING/PACKING INSTRUCTIONS



DETAIL 1





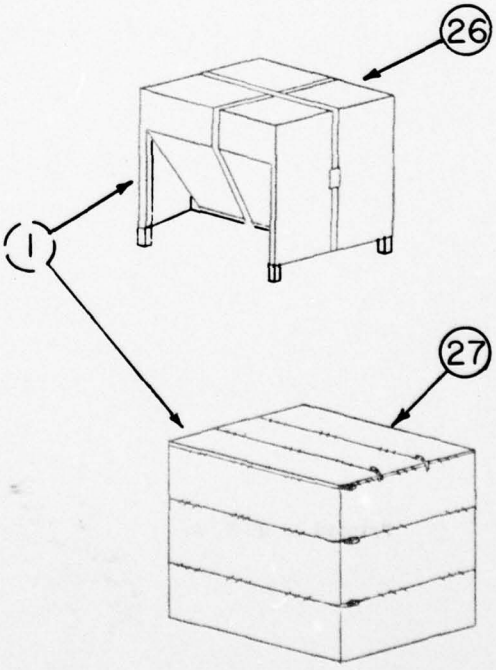


FIGURE A

FIGURE B

IMPORTANT - PLEASE READ ENTIRE INSTRUCTION BEFORE PROCEEDING.

* Padded van shipments only

** Common carrier shipments only

Unpacking instructions

1. Remove mat or cap and poly cover. Cut all strapping and remove jiffy wrap and furniture pads. (Figure A & B)

2. If paper holder is shipped, unpack from carton. (Figure A)

**3. Lift machine from pallet (2 men required). If one man operation, remove bolts from risers and slide machine from pallet, one end at a time.

4. Raise printer, remove foam pads, remove bolts and spacers inside printer. (Figure B)

5. Remove all tape from printer and replace platen knobs. (Figure B)

6. Open door to relay gate and remove brackets. (Figure A, Detail 1).

Packing Instructions

7. Open gate. Attach brackets to gate, to frame, and to each other. (Figure A, Detail 1)

Screw	9	731629
Bracket-gate	1	7340955
Bracket-frame	1	7340956

8. On all shipments to other equipment manufacturers attach lead (OEM) seal to frame.

Seal	1	7340746

*9. Pull cables through slot in bottom frame, coil and place on top of filter. Close gate.

10. Remove platen and top cover from printer, remove platen knobs from platen. Tilt printer back, place leg spacers in front and hex extensions with washer in rear. Line up over holes in bottom cover (Figure B)

Leg spacer	2	7340804
Washer	2	3550
Hex Extension	2	7340834

11. Tilt printer and bottom cover back. Mount printer to cover. (Figure B)

Washer	4	3550
Rubber Washer	4	7340370
Screw-front	2	36112
Screw-rear	2	36844

12. Line bottom pan with foam pads. (Figure B)

Pad	2	7340953
Pad	4	7340954

13. Replace printer cover and platen. Tape carrier mechanism to extreme left, tape paper bail end switch. (Figure B)

Tape	*	7340307

14. On shipments to United Kingdom place "Made in U.S.A." label beneath IBM nameplate on top cover.

Label	1	7340939

**15. Tape poly bags on legs. (Figure A)

Tape	*	7340307
Poly bag	4	7340631

**16. Fasten build-up risers and rails to pallet. Place machine on pallet. (Figure A)
NOTE: Line up front of machine with front of pallet.

Riser	2	7340951
Rail	2	7340952
Pallet	1	7340666
Bolt Riser	4	7340968
Bolt rail	4	59666
Washer	8	7320140

**17. Coil cables and tape to bottom of pallet.

Tape	*	7340307

18. Fold jiffy wrap and place on printer. Tape furniture pads on reading board. (Figure A)

Jiffy wrap	4	7340404
Furniture pad	6	7340046
Tape	*	7340307

19. Band 2 places front to rear over printer (Figure A)
NOTE: For common carrier make sure bands are in slots in rails.

Strapping	*	7340734
Seals	2	7340735

**20. Band 2 places side to side making sure strapping is in slots in risers. (Figure A)

Strapping	*	7340734
Seals	2	7340735

21. On all shipments from plant calling for IR cards; place log book (120-1133), code guide cards (229-2108-0 & 229-2109-0), IR card deck (making sure serial numbers of IR cards match machine serial number) into plastic folder (451125). Tape folder to reading board.

Tape	*	7340307

21A. If shipment calls for PAIR cards; place log book (B-11518) , code guide card (229-2108-0 & 229-2109-0), PAIR card deck (making sure serial numbers of PAIR cards match machine serial number) into plastic folder (451125). Tape folder to reading board.

PACKING/UNPACKING INSTRUCTIONS

22. If shipment calls for paper holder, place in poly bag. Wrap tray, rod, & knob in jiffy wrap and place in carton. Tape carton in depression in stand (Figure A)

Poly bag	1	7340227
Jiffy Wrap	*	7340404
Carton	1	7341030
Tape	*	7340307

23. Tape accessory kit to reading board. Place platen knobs in jiffy bag and tape to reading board.

Tape	*	7340307
Jiffy bag	1	7340646
Acc. Kit	1	7340469

*24. Tape liner over printer. (Figure A)

Tape	*	7340307
Liner	1	7341121

25. Cover machine with poly cover (Figure A)

Poly cover	1	7340982

*26. Cut poly cover in front and place cap over machine, band. (Figure B)

Cap	1	7341122
Strapping	*	7340734
Seal	2	7340735

**27. Fasten mat and top around unit. (Figure B)

Mat	1	7340667
Top	1	7340668

27A. For Export use:

Mat	1	7340898
Top	1	7340899

28. Place unpacking instructions on outer cap or mat.

Instructions	1	7340967

	2740	2741
Machine Weight	196#	194#
Shipping Weight		
Padded Van	210#	208#
Common Carrier	268#	266#
Export	300#	298#

Dimensions	Length	Width	Height	Cube
Padded Van	29-1/2	26	36-1/2	16
Crated	39-1/2	34-1/2	49-1/4	38

Type of Shipment	B/M	Required group
Plant & Field Padded Van	7340966	I + A
Plant & Field Common Carrier	7340961	I + II + B
Export-Air	7340961	I + II + C

Group	Description	Qty.	Part Number
I	Instructions	1	7340967
	Washer	6	3550
	Screw-front	2	36112
	Screw-rear	2	36844
	Screw-bracket	9	731629
	Furniture pad	6	7340046
	Tape	*	7340307
	Rubber Washer	4	7340370
	Jiffy Wrap	4	7340404
	Kit-Accessories	1	7340469
	Jiffy bag	1	7340646
	Strapping	*	7340734
	Seal-strapping	4	7340735
	Seal (OEM)	1	7340746
	Leg spacer	2	7340804
	Hex-extension	2	7340834
	Label (Made in U.S.A.)	1	7340939
	Foam pad - machine	2	7340953
	Foam pad - board	4	7340954
	Bracket - gate	1	7340955
	Bracket - frame	1	7340956
	Cover-poly	1	7340982
	Poly bag - paper holder	1	7340227
	Carton-paper holder	1	7341030
A	Liner	1	7341121
	Cap	1	7341122
II	Bolt-Rail	4	59666
	Washer	8	7320140
	Poly bag	4	7340631
	Pallet	1	7340666
	Riser	2	7340951
	Rail	2	7340952
	Bolt-Riser	4	7340968
B	Mat	1	7340667
	Top	1	7340668
C	Mat	1	7340898
	Top	1	7340899

Unpacking/Packing Instructions

7340967

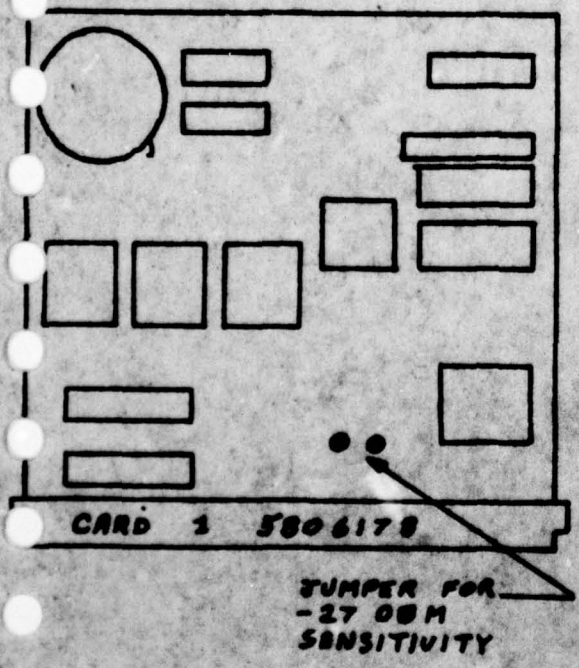
Limited Distance Line Adapter Type 2 B

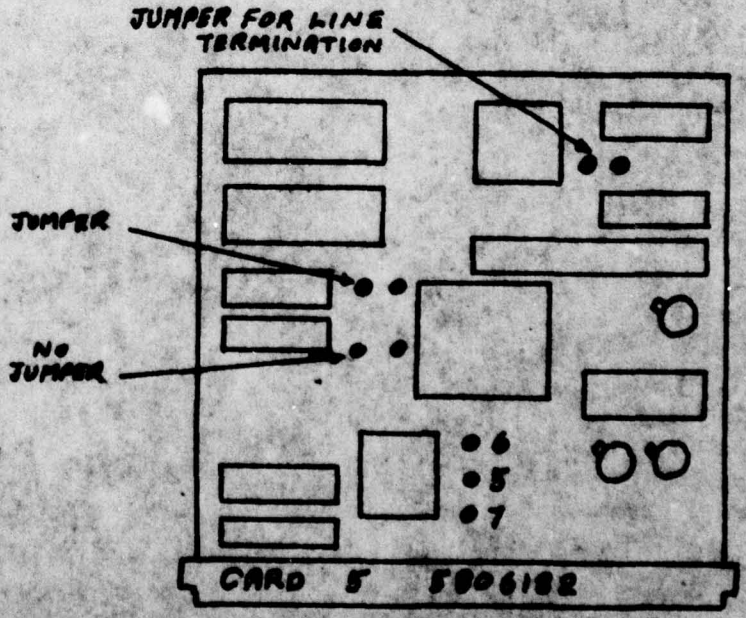
Transmit Level

The transmit level is adjusted by shorting pins on the circuit cards. All modems on a network must be at the same transmit level. When using a common carrier line, the transmit level must not exceed -8 dbm.

Transmit Level	Peak-to-Peak Voltage*	SMS Card 1	SLT Card 5
0 dbm	2.2 volts	pins 6 & 7	1K & .91K resistors
-6 dbm	1.1 volts	pins 5 & 6	.91 K resistor
-8 dbm	.876 volts	none	none

* Peak-to-peak voltage values apply only to a 600 ohm communication line.





Receiver Sensitivity

The receiver sensitivity is -27 dbm. Any incoming signal that has an amplitude below this level will cause errors and clamp the receive data line.

Receiver sensitivity is adjustable as follows:

Sensitivity	SMS Card 2	SLT Card 1
-27 dbm	pluggable resistor shorted	pluggable resistor shorted
-21 dbm	resistor not shorted	resistor not shorted

Reducing the receiver sensitivity to -21 dbm will sometimes enable operations on lines that are short, with a high received signal and are noisy. Do not reduce the receiver sensitivity if the signal level at the receiver is less than -21 dbm.

Line Length

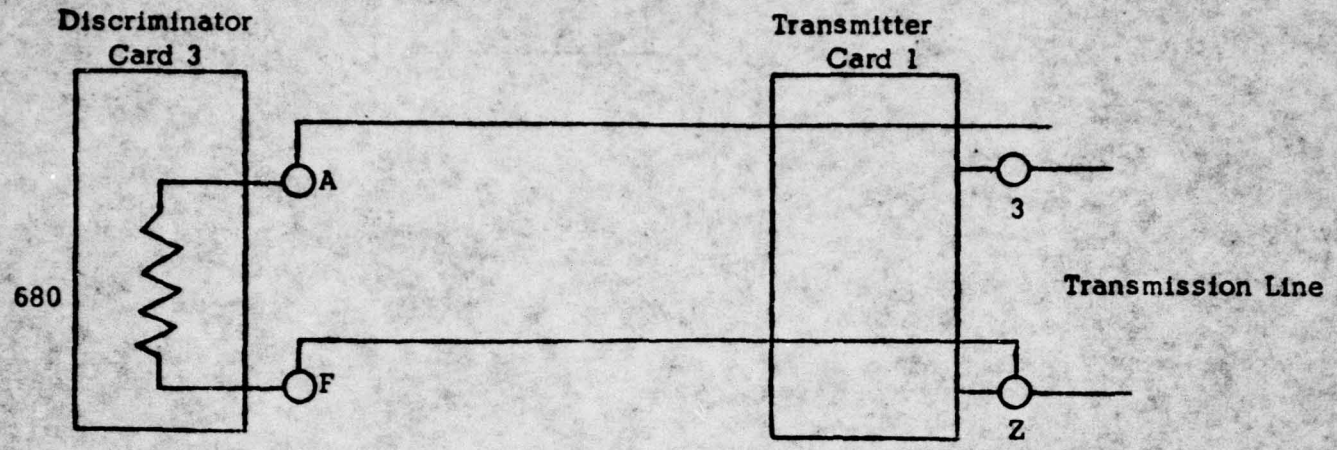
The maximum line length for a limited distance line adapter type 2 network is 8.25 wire miles. This varies with the type of cable used and the network configuration. Refer to SRL publication A24-3435 for complete line length tables and cable specifications.

Line Termination (Figure 1)

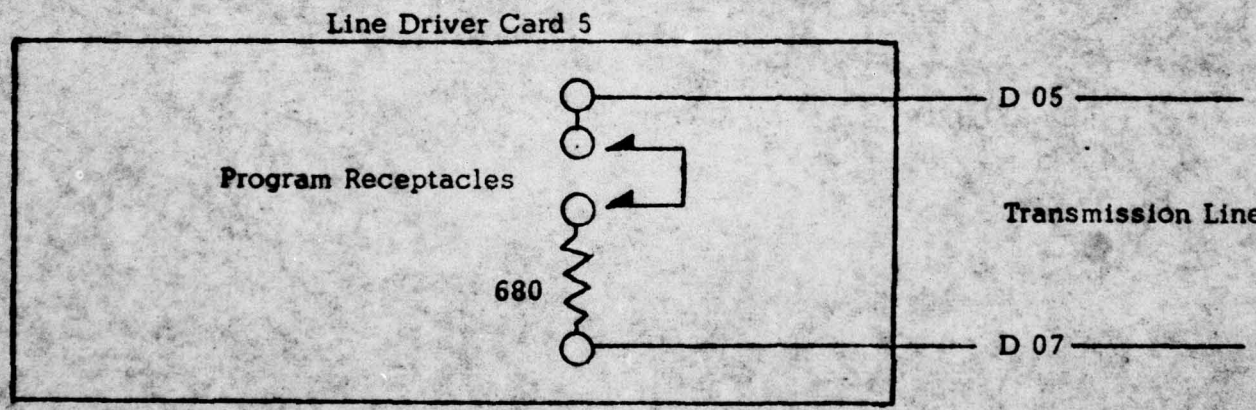
A termination of 680 dbm resistance must be placed at the two ends of a long line network or at the end of all radial lines. The line termination is provided as part of the basic modem. It is found across pins A and F, or modem card 3, (discriminator) in the SMS version and on modem card 5 (line driver) of the SLT version. The figure shows the connection of the terminating resistance to the transmission line.

If there are both type 2A and 2B limited distance modems on the same system, the network is terminated as follows:

1. Use the 680 ohm resistor if the normal termination point is at a type 2B modem.



SMS VERSION



SLT VERSION

Figure 1, Line Termination

2. Use the resistance-inductance termination (see line balancing type 2A) if there is a type 2A modem at the normal termination point.

Exception: If there is one or more type 2A modems in close proximity to the type 2B selected for termination, use the resistance-inductance termination.

Line Testing

An operational line test must be made on any new installation or when a change is made to an existing network. This test is performed by the communication line simulator. Refer to the section on the simulator in this manual for testing and operational procedures.

Removal of a Terminal from a Transmission Line

The following procedure should be used when a data terminal is removed from a transmission line to insure that proper line termination of the network is maintained:

1. Check to see if the terminal to be removed has the 680 ohm line terminating resistor connected. It is located between pins A and F on SMS card 3 or on pluggable caps on SLT card 5.

2. If the termination is connected, substitute a 600 ohm 1/4 watt or higher across the transmission line when the terminal is removed.

3. When the terminating resistor is not connected (side leg), a 5 K resistor of 1/4 watt or higher rating resistor must be placed across the transmission line when the terminal is removed.

Modem Simulation

A limited distance type 2B modem may be simulated on the line with a 5.0 K resistor, 1/4 watt rating or higher. This permits an entire network to be installed without the installation of all the data terminals.

Use of Limited Distance Type 2A and Type 2B on the same Network

All limited distance line adapters Type 2 can be used on the same network. If Type 2 A and Type 2B are used on the same network, the following apply:

1. In an individual terminal, either the complete Type 2A or the complete 2B, modem must be used.

2. Line length specifications are not changed. See SRL (A24-3435).

3. The Type 2A requires a variable resistance-inductance termination while the 2B uses a 680 ohm resistance. If there is a mixed system, a 680 ohm resistance will be used if the modem at the normal termination point is the type 2B modem. If there is a Type 2A modem at the termination point, the resistance-inductance termination should be used.

   Note: If there is one or more Type 2A in close proximity to Type 2B, the Type 2A termination should be used because of its equalization benefits necessary to the Type 2A.

IBM®

Field Engineering

Installation Manual

2740
2741

Communications Terminal

PREFACE

This manual is a guide for installing the IBM 2740/2741 Communications Terminal. The manual contains installation procedures, cabling instructions, and test procedures for making the unit operational for a customer.

The manual, includes installation instructions for the following units.

IBM 2740 Communications Terminal
IBM 2741 Communications Terminal

Keep the installation manual with the unit for possible use when re-installing the equipment. Installation manuals are updated frequently and a new manual obtained at the time of re-installation may lack information pertinent to these units.

Address comments concerning the contents of this publication to:
IBM Corporation, Field Engineering Division, Dept. 918, Lexington, Kentucky, 40507
Form No. 229-9502-0

CONTENTS

Chapter	Title	Page
1	INTRODUCTION	1-1
	1. General Information	1-1
	1.1 2740 Communications Terminal	1-1
	1.2 2741 Communications Terminal	1-1
	2. Physical Size and Weight	1-1
	3. Special Tools and Test Equipment	1-2
2	ASSEMBLY	2-1
	1. Unpacking	2-1
	2. Unit Placement	2-1
	3. Preparation For Reshipment	2-1
3	CABLE INSTALLATION	3-1
	1. AC Power	3-1
	2. Data Set Cable	3-1
	3. Modem Cable	3-1
4	UNIT TESTING	4-1
	1. Preliminary Check	4-1
	2. Voltage Check	4-1
	3. Local Mode Test	4-1
	4. Base Point to Point Machine Test	4-1
	5. EOB/Auto EOB Test	4-1
	6. Transmit Control Test	4-1
	7. Station Control	4-2
	7.1 Program Cap Plugging Chart	4-2

1. GENERAL

The safety practices shown on the "CE Safety Practice" card, Form Number 124-0002, should be followed. This card is available, and is issued to all Customer Engineers.

No CE should work alone when performing maintenance or repairs of equipment that has power on. At least one other person should be present in the room whenever any work is done on a machine.

Every CE should wear safety glasses during any maintenance or repair operation.

Make sure there are fire extinguishers in each room where there are system components. Fire extinguishers should be of the CO_2 type.

In some instances dangerous voltages are still present inside the unit, even with power off. If it is necessary to work near line power connectors or inside power supplies disconnect the power cord or turn off main circuit breaker.

Always discharge capacitors before working on power supply.

Turn off power before replacing any fuses.

Replace any safety covers that have been removed, before going on to another operation. Hazardous voltages are present in this equipment, forgetfulness could be fatal.

Do not use ungrounded tools or test equipment.

1. GENERAL INFORMATION

1.1 2740 Communications Terminal

The IBM 2740 Communications Terminal provides the user with a communications unit for point to point or multiplexor operation using common carrier dial or leased lines, or "IBM" modems. When not in use as a communications terminal the typewriter may be used as a standard office machine.

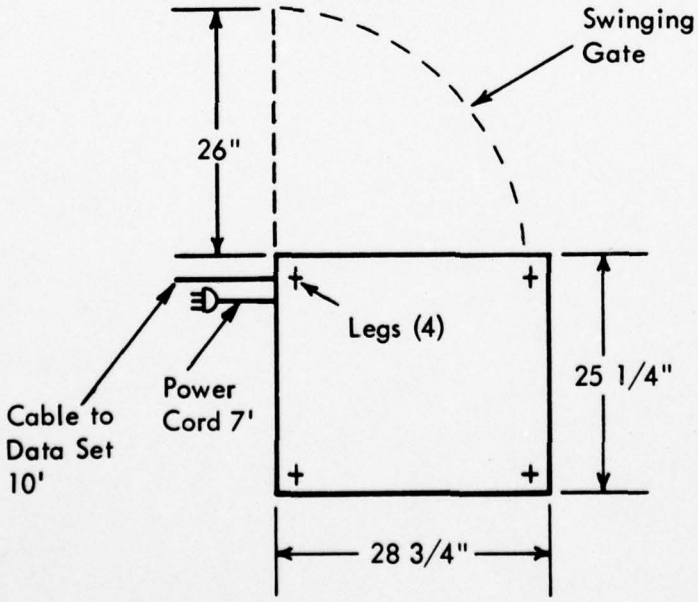
1.2 2741 Communications Terminal

The 2741 terminal looks and acts outwardly much like the standard typewriter. The only terminal controls mounted on the keyboard are the ON/OFF switch and the attention key which replaces the index key.

The terminal will operate with IBM modems or common carrier data sets. There will be only one terminal per multiplexor line so that polling and addressing will not be required.

The terminal has two basic modes of operation, local and communicate. Local operation, with the exception of the attention key, is the same as the "Selectric" typewriter. No information will be transmitted or received. In communicate mode transmission to and reception from the computer is possible.

2. PHYSICAL SIZE AND WEIGHT



Dimensions: Width 28-3/4", Depth 25-1/4", Height 36-1/2"
Maximum Weight: 325 pounds
Service Clearance: Front 30", Rear 42", Left 18", Right 18"

3. SPECIAL TOOLS AND TEST EQUIPMENT

The following tools should be available during installation.

CE Aid Box, PN 1272825
SLT Test Light, PN 9900378
Oscilloscope (modem)
Selectric I/O Tools

1. UNPACKING

The unit should be placed as close to the designated position as possible to eliminate unnecessary moving. Unpack the unit carefully, using the unpacking instructions provided as a guide. These instructions are on the outside of the unit. When the installation is complete, file the unpacking instructions with this manual for future reference.

2. UNIT PLACEMENT

The unit should be moved to the final position, indicated by the customer, when all packing materials have been removed. If the cables are to be routed under the floor the cut-out should be located at the left rear of the unit.

3. PREPARATION FOR RESHIPMENT

Shipping of systems and units is described in detail in the branch office manual. Packing material required for shipment may be ordered from the manufacturing plant as described in the branch office manual. The packing material for the 2740/2741 Communications Terminal is in BM 7340966, for padded van shipment, or BM 7340961 for common carrier and export, available from IBM, Lexington, Kentucky.

3 CABLE INSTALLATION

1. AC POWER

Voltage specifications may be found on back of stand under rear cover. Be sure to check that Customer voltage matches machine requirements before installation.

Electrical Requirements

Voltage: 115 or 200/230 ± 10%
Frequency: 60 ± 1/2 CPS
Phase: 1
KVA: 0.15
Service: 15 Amps.
Plug Types:
Hubbell or Pass & Seymour 5267 (115 volts, nonlock)
Hubbell or Pass & Seymour 4720 (115 volts, locking)
Hubbell 5666 (208/230 volts nonlocking)
Hubbell or Pass & Seymour 4770 (208/230 volts, locking)

Customer Provides Matching Receptacle: Hubbell or Pass & Seymour 5262 for 5267 plug, 4700 for 4720 plug, 5662 for 5666 plug, 4750 for 4770 plug.

A 7' power cable is supplied with machine. If cables are to be routed under floor, cutout should be located at left rear of machine.

2. DATA SET CABLE

All data set installations should be completed prior to arrival of machine. Connection to data set is accomplished with 10' data set cable supplied with unit. Connection is made to rear of data set with 25 pin socket marked "Customer Equipment". Check that data set has AC voltage applied.

3. MODEM CABLE

A 10' modem cable is supplied with units using IBM modems. All modem installations should be performed as covered in SRL "Planning and Installation of a Data Transmission System" F/N A24-3435-1 and FE instruction-maintenance manual, "IBM" Line Adapter Units F/N 225-3473-0.

1. PRELIMINARY CHECK

Before applying power to unit make a complete visual check of unit for possible damage or loose parts. Check SLT Gate for loose cards, edge connectors, or bent back panel pins. Check power supply mounting for damage during shipment.

2. VOLTAGE CHECK

Apply power to unit and check voltages to SLT Gate and I/O.

+ 48 Volts, ± 4 Volts
+ 12 Volts, ± .6 Volt
- 12 Volts, ± 1 Volt

3. LOCAL MODE TEST (2740/2741)

With machine in local mode test all typewriter functions for proper operation. Using check loop perform preliminary test of electronics.

4. BASE POINT TO POINT MACHINE TEST (2740/2741)

Establish connection with compatible terminal, or multiplexor, in communicate mode and verify transmission and reception of all printer characters/functions and operation of basic control buttons.

5. EOB/AUTO EOB TEST (2740)

During normal transmission verify EOB operation. Verify error detection by generating error (simultaneous depression of space and backspace).

6. TRANSMIT CONTROL TEST (2740)

With TC switch in normal position verify normal operation with compatible terminal (Terminal 2).

Place unit in TTC mode (Terminal 2 in normal). Bid and depress "/" "space". Terminal should go to control receive (standby).

Leave unit in TTC position (Terminal 2 in TTC position). Bid and depress "/" "space". Terminal should go into receive text (Terminal 2 to transmit).

Leave both units in TTC position; reverse procedure sending "/" "space" from Terminal 2 and verify operation (Terminal 2 to Receive, Terminal 1 to transmit).

Place terminal in MTC position (Terminal 2 normal). Depress Bid, should operate as normal terminal.

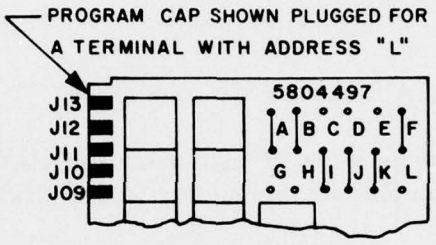
Leave terminal in MTC (Terminal 2 in TTC). Send "/" "space" from Terminal 2. Terminal 2 should go to Receive Text, Terminal 1 to Transmit Text.

7. STATION CONTROL (2740)

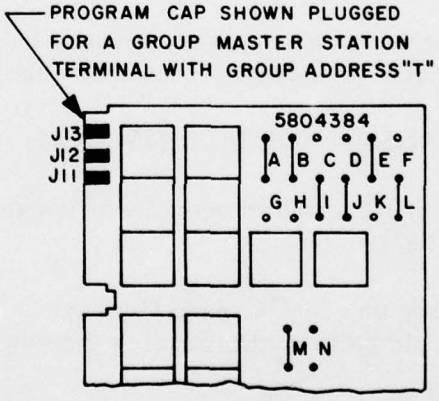
Information is not available at this time. It will be included in the manual at a later date.

7.1 PROGRAM CAP PLUGGING CHART

PROGRAM CAP PLUGGING CHART	
ADDRESS CHARACTERS (GROUP OR TERMINAL)	JUMPER PLUG ARRAY PLUGGED ON 5804497 FOR TERMINAL ADDRESS (SEE EXAMPLE NO.1) OR ON 5804384 FOR GROUP ADDRESS (SEE EXAMPLE NO.2)
A	A, E, F, H, I, J
B	B, E, F, G, I, J
C	A, B, E, F, I, J
D	C, E, F, G, H, J
E	A, C, E, F, H, J
F	B, C, E, F, G, J
G	A, B, C, E, F, J
H	D, E, F, G, H, I
I	A, D, E, F, H, I
J	A, F, H, I, J, K
K	B, F, G, I, J, K
L	A, B, F, I, J, K
M	C, F, G, H, J, K
N	A, C, F, H, J, K
O	B, C, F, G, J, K
P	A, B, C, F, J, K
Q	D, F, G, H, I, K
R	A, D, F, H, I, K
S	B, E, G, I, J, L
T	A, B, E, I, J, L
U	C, E, G, H, J, L
V	A, C, E, H, J, L
W	B, C, E, G, J, L
X	A, B, C, E, J, L
Y	D, E, G, H, I, L
Z	A, D, E, H, I, L



EXAMPLE NO. 1



EXAMPLE NO. 2

NOTES: 1. IF A TERMINAL IS DESIGNATED AS GROUP MASTER, THE "M" JUMPER IS PLUGGED ON 5804384. IF A TERMINAL IS DESIGNATED AS ALL CALL MASTER, THE "N" JUMPER IS PLUGGED ON 5804384.

2. A SPECIFIC CHARACTER MAY BE USED FOR A TERMINAL OR A GROUP ADDRESS BUT SHOULD NEVER BE USED FOR BOTH ON THE SAME LINE.

IBM®

Field Engineering

Maintenance Manual

2740

2741 Communications Terminal

PREFACE

This manual contains preliminary information. The information has not been technically approved and is therefore subject to change.

The following operational modes of the 2740 are covered in this manual:

- Contention
- Dial
- Station Control

The following features are covered in this manual:

- Record Checking
- Transmit Control

Address comments concerning the contents of this publication to: IBM Corporation, Field Engineering Division, Dept. 918, Lexington, Kentucky, 40507

© International Business Machines Corporation, 1966

TABLE OF CONTENTS

Heading		Page
	CHAPTER 1 DIAGNOSTIC AIDS	
SECTION 1	DIAGNOSTIC TECHNIQUES	1-1
1.1	2740/2741 Maintenance Philosophy	1-1
1.2	Configurations	1-1
1.3	Data Flow	1-2
1.4	Line Control	1-2
1.4.1	Point to Point Contention	1-3
1.4.2	Addressing	1-3
1.4.3	Polling	1-3
1.4.4	2741 Communication	1-4
1.5	2740/2741 Systems Flow Diagrams	1-5
1.5.1	2740 With No Features	1-5
1.5.2	2740 With Record Checking and Auto EOB	1-6
1.5.3	2740 With Dial and Record Checking	1-7
1.5.4	2740 With Dial and Transmit Control	1-8
1.5.5	2740 With Station Control	1-9
1.5.6	2741 With Interrupt	1-10
1.6	CE Aid Box	1-11
1.7	CE Test Probe	1-12
SECTION 2	SERVICE AID INDEX	1-13
SECTION 3	SERVICE AIDS	1-15
	CHAPTER 2 MAINTENANCE FEATURES	
SECTION 1	CHECK LOOP	2-1
SECTION 2	TRANSMIT AND RECEIVE LIGHTS	2-2
	CHAPTER 3 PREVENTIVE MAINTENANCE	
SECTION 1	MAINTENANCE SCHEDULE	3-1
SECTION 2	MAINTENANCE ROUTINE	3-2
3.1	Power Supply	3-2
3.2	Electronic Gate	3-2
3.3	Indicator Lights	3-2
3.4	Control Switches	3-2
3.5	Printer	3-2
	CHAPTER 4 CHECKS, ADJUSTMENTS AND REMOVAL PROCEDURES	
4.1	Power Supply Removal	4-1
4.2	Printer Removal	4-1
4.3	Printer Checks, Adjustments and Removal Procedures	4-1
	CHAPTER 5 POWER	
SECTION 1	VOLTAGES	5-1
SECTION 2	FUSE REQUIREMENTS	5-1
5.1	Input Fuses	5-1
5.2	D.C. Supply Fuses	5-1
	CHAPTER 6 LOCATIONS	
SECTION 1	ELECTRONIC GATE	6-1
SECTION 2	SWITCHES AND INDICATORS	6-2
SECTION 3	CARD LOCATION GUIDE	6-3
APPENDIX A	FIELD ENGINEERING REFERENCE MATERIAL	A-1
A.1	Flip-Flop, Latch and Trigger Descriptions	A-1
A.2	2740 Code Chart	A-7
A.3	2741 Code Chart	A-8
A.4	Mode Chart	A-9
A.5	Line Adapters and Data Sets	A-10
A.5.1	Line Adapters and Data Sets	A-10
A.5.2	Lines	A-10
A.5.3	Data Set Specifications	A-10
A.5.4	Data Set Circuits	A-10
A.5.5	Data Set Interface 103A	A-11
A.5.6	Data Set Interface 103F	A-11

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Terminal Configurations	1-1
1-2	Data Flow	1-2
1-3	Line Control	1-3
1-4	2741 Communications with Multiplexor	1-4
1-5	2740 With no Features	1-5
1-6	2740 With Record Checking and Auto EOB	1-6
1-7	2740 With Dial and Record Checking	1-7
1-8	2740 With Dial and Transmit Control	1-8
1-9	2740 With Station Control	1-9
1-10	2741 With Interrupt	1-10
1-11	CE Aid Box Data Flow	1-11
1-12	CE Test Probe	1-12
2-1	Check Loop Data Flow	2-1
6-1	Major Assembly Locations	6-1
6-2	SLT Board Pin Locations	6-2
6-3	2740 Control Keys and Indicators	6-2
6-4	2740/2741 Switch Locations	6-3

LIST OF TABLES

Table		Page
1-1	Line Control Characters	1-2
1-2	Wiring Chart (SLT Board-Connector-CE Aid Box Card)	1-12
3-1	Preventive Maintenance Schedule	3-1
6-1	2740 B1 Board Card Locations	6-3
6-2	2741 B1 Board Card Locations	6-4
6-3	2740/2741 C1 Board Card Locations	6-4
6-4	2740 A1 Board Card Locations	6-5
A-1	2740 Code Conversion - BCD Head	A-7
A-2	2741 Code Conversion-Correspondence Head	A-8
A-3	Mode Chart	A-9
A-4	Data Set Interface-103A	A-11
A-5	Data Set Interface-103F	A-11

SAFETY

Safety cannot be overemphasized. Ensure your own safety, and the safety of co-workers, by making it an everyday practice to use caution at all times, and by being aware of potentially dangerous areas within the terminal. Be sure to read and follow the safety suggestions in form 229-1264, a pocket-sized card issued to all IBM Customer Engineers.

Remember:

- Loose clothing can become entangled in moving parts of the printer.
- Remove printer platen or platen knobs to ensure that the printer will be in the correct TILT UP position when used.
- CAUTION: 110 volts is applied to the contacts of the motor contactor relay in the printer when power is ON.
- Heat sinks are at an electrical potential. DO NOT short heat sink to the frame of the power supply.
- Always unplug machine power and wait ONE FULL MINUTE before attempting repairs or adjustments in the power supply area.
- Voltages developed in the resonant circuit of the regulated power supply are apt to be much higher than line voltage levels.

CHAPTER 1

DIAGNOSTIC AIDS

SECTION 1. DIAGNOSTIC TECHNIQUES

1.1 2740/2741 MAINTENANCE PHILOSOPHY

The general maintenance philosophy of the 2740/2741 terminals is that diagnosis and repair of malfunctions will be effected with the terminal "off-line". Comprehensive verification tests will be performed "on-line".

When a malfunction in a system occurs, it must first be determined that a terminal is the failing unit, then the malfunctioning component within the terminal must be located and repaired. Terminal service aids, such as the CE Aid Box, and the indicator lights on the 2740, provide graphic indications of the terminal operation. Additionally, diagnostic programs may be available to assist in "on-line" trouble-shooting, when the terminal is attached to a multiplexor.

The philosophy of rapid fix and restoration is repair, not substitution, of major assemblies. Diagnosis is accomplished by a point-to-point analysis, and the isolated fault is corrected by substitution or repair of the faulty part. If an SLT card is the cause of failure, the card is replaced. No attempt to repair the card is recommended.

1.2 CONFIGURATIONS (Figure 1-1)

The 2740 Terminal will communicate over dial, leased, or customer-owned lines. It can communicate with other 2740's point-to-point or multipoint on a contention basis. It can also communicate with a CPU via certain IBM Multiplexors.

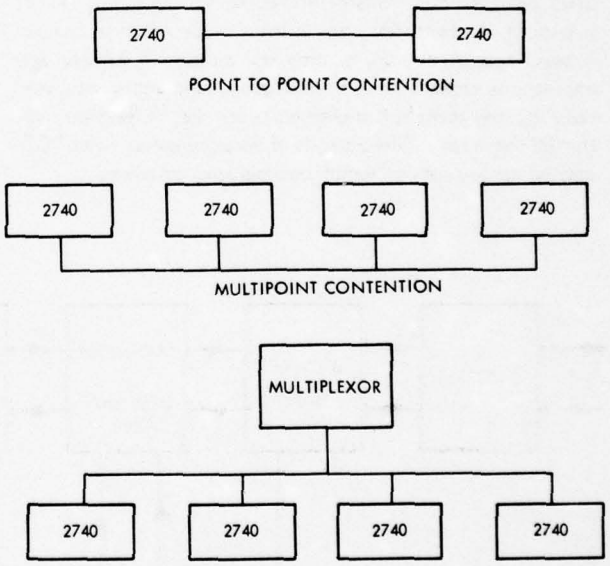


FIGURE 1-1. TERMINAL CONFIGURATIONS

AD-A066 413 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G 13/1
DESIGNER'S HANDBOOK - INSTALLING THERMAL PIPELINE SYSTEMS, PART--ETC(U)
FEB 78 I P ALEKSANDROV, I V BELYAYKINA

UNCLASSIFIED FTD-ID(RS)T-0094-78-PT-1 NL

8 OF 8
ADA
066413



END
DATE
FILMED
5-79
DDC

END
DATE
FILMED
5-79
DDC

1.3 DATA FLOW (Figure 1-2)

Data to be transmitted is originated in one of the following ways:

1. Typing a character on the 835 Printer.
2. Depressing a control key (Bid, EOT, etc.)
3. Within the control unit as an answer back to a Multiplexor or another terminal.

Any of the above actions place a character in the 1B Register. It is then transferred to the serializer-deserializer register (ser-des) and, via a modem or data set, is clocked out on the line.

Received data enters the ser-des register from the modem or data set. It is converted from serial to parallel data as it is transferred to the 1B Register. If it is a control character, the proper mode change occurs. A print operation may or may not occur depending upon the character. If a normal print character was received, the data is transferred from the 1B Register to the 2B Register. The data is then converted from BCD coding to Selectric® latch coding and printed.

1.4 LINE CONTROL (Table 1-1)

TABLE 1-1. LINE CONTROL CHARACTERS

LINE CONTROL CHARACTERS

DESCRIPTION	SYMBOL	BIT CONFIGURATION	PROCESSOR CHARACTER
End of Text (EOT)	Ⓒ	C-8-4-2-1	
End of Address (EOA)	Ⓓ	8-2-1	# (pound sign)
Negative Response	Ⓝ	B	- (hyphen)
Positive Response	Ⓨ	B-A-8-2-1	. (period)
End of Block (EOB)	Ⓑ	C-A-8-4-2	
Start of Address (SOA)	Ⓢ	C-A-8-2-1	(comma)

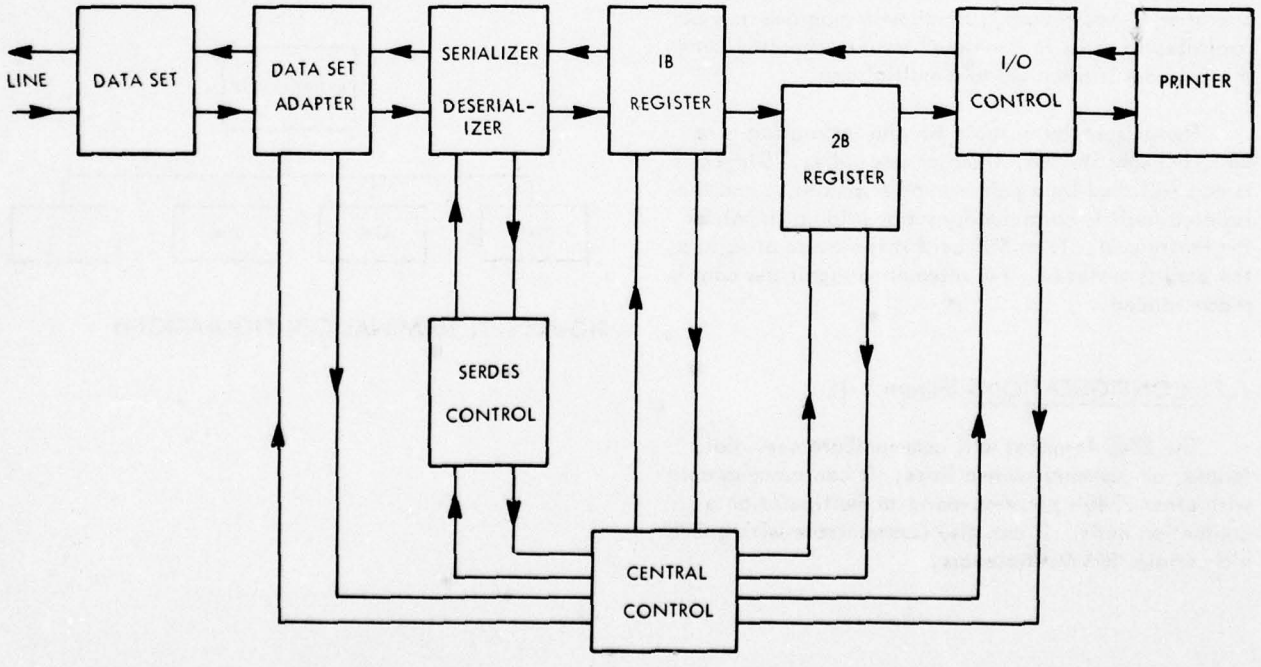
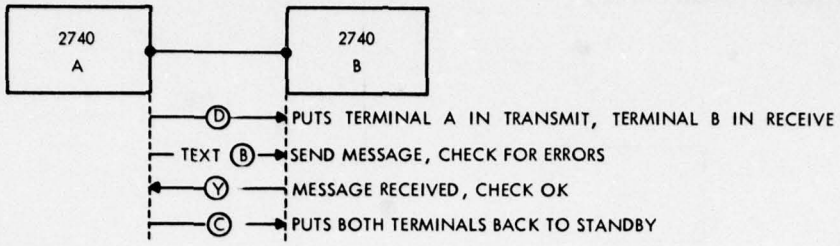
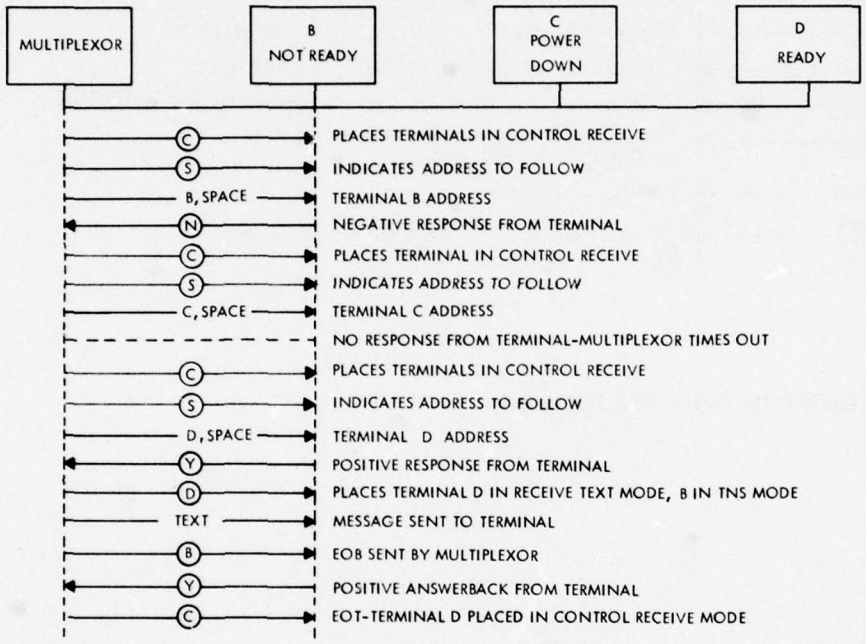


FIGURE 1-2. DATA FLOW

1.4.1 POINT TO POINT CONTENTION



1.4.2 ADDRESSING



1.4.3 POLLING

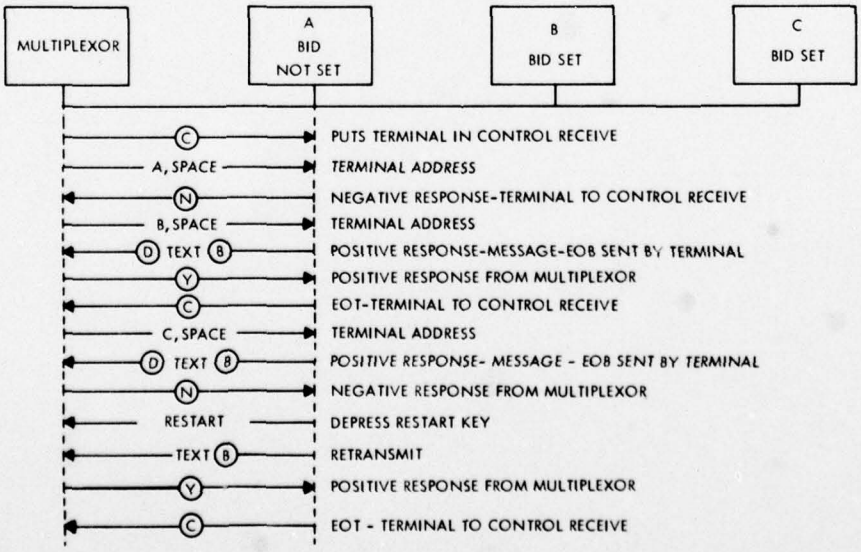


FIGURE 1-3. 2740 LINE CONTROL

1.4.4 2741 COMMUNICATIONS (FIGURE 1-4)

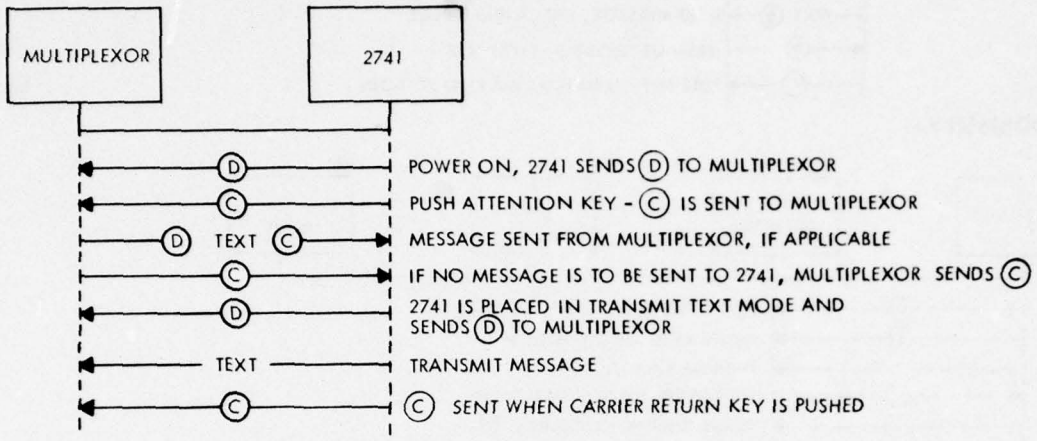


FIGURE 1-4. 2741 COMMUNICATIONS WITH MULTIPLEXOR

1.5 2740/2741 SYSTEM FLOW DIAGRAMS

1.5.1 2740 WITH NO FEATURES (FIGURE 1-5)

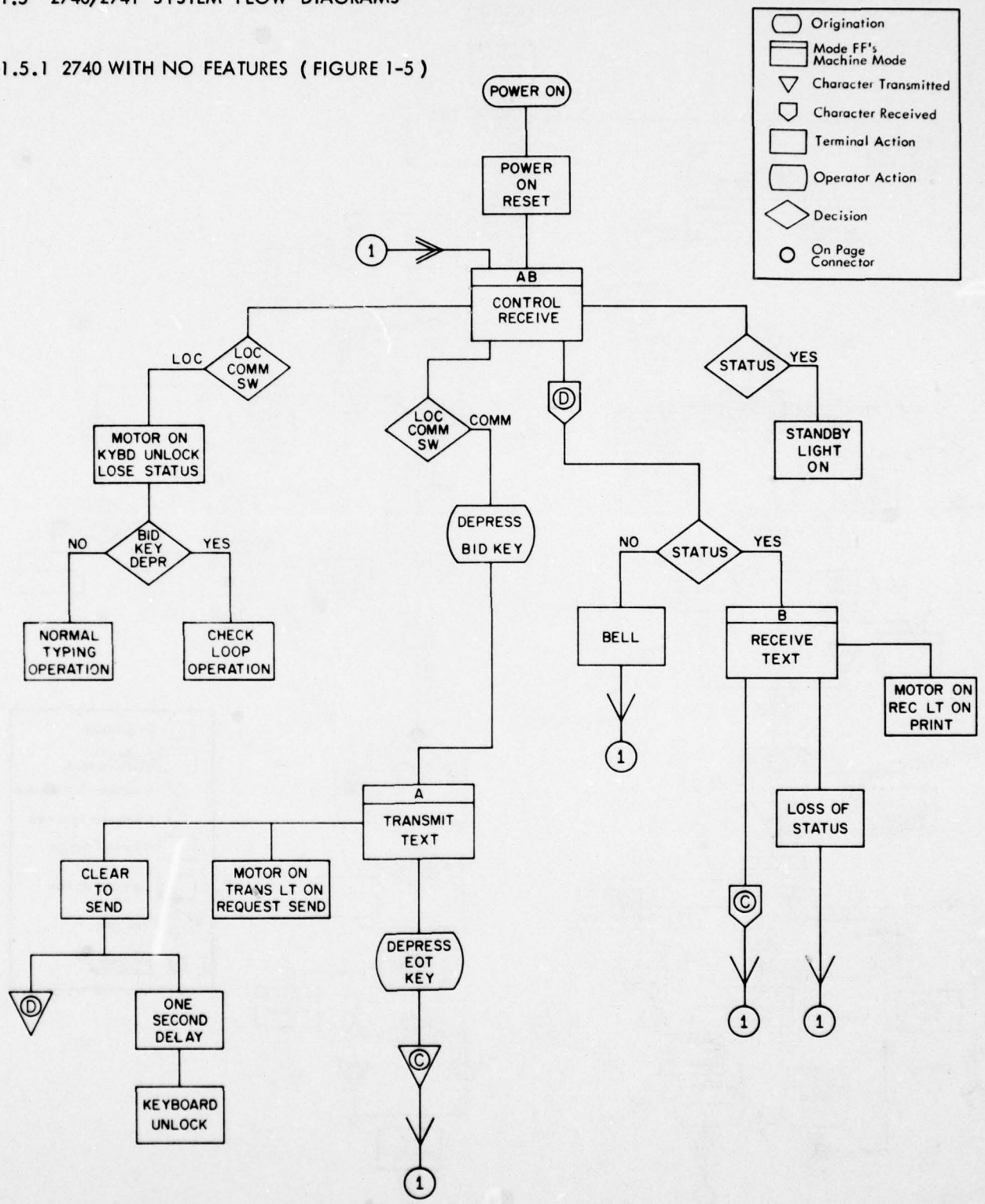


FIGURE 1-5. 2740 WITH NO FEATURES

1.5.2 2740 WITH RECORD CHECKING AND AUTO EOB (FIGURE 1-6)

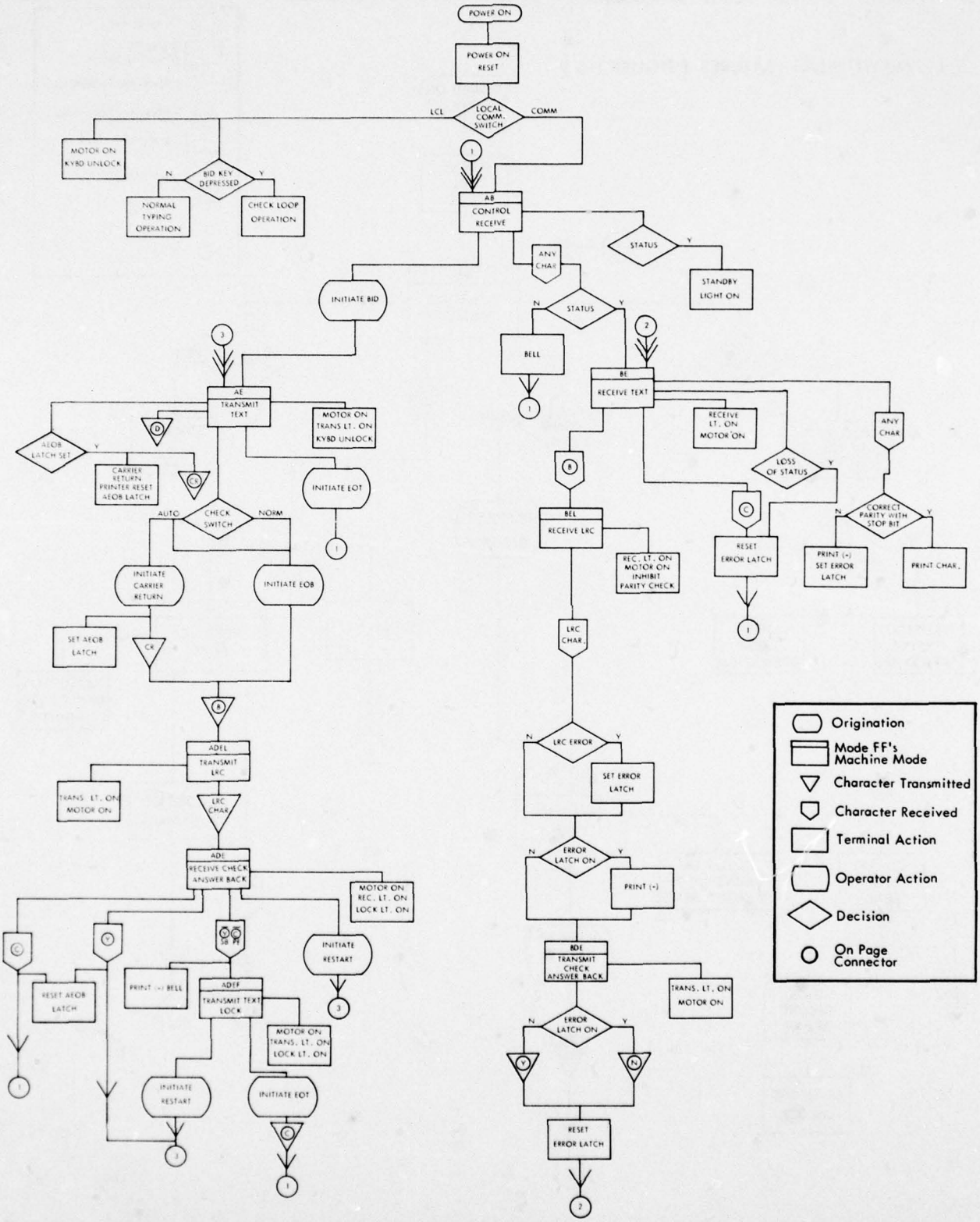


FIGURE 1-6. 2740 WITH RECORD CHECKING AND AUTO EOB

1.5.3 2740 WITH DIAL AND RECORD CHECKING (FIGURE 1-7)

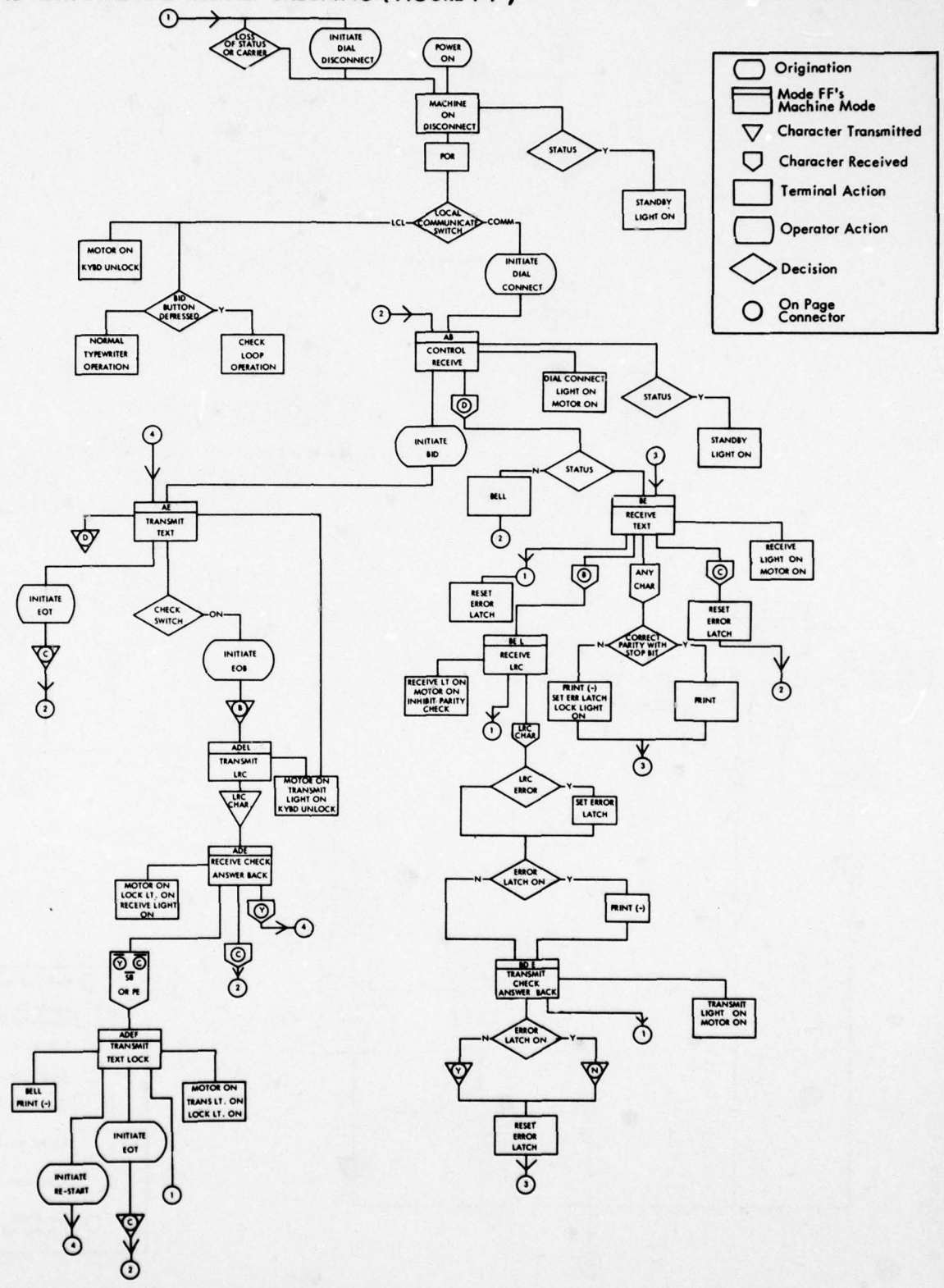


FIGURE 1-7. 2740 WITH DIAL AND RECORD CHECKING

1.5.4 2740 WITH DIAL AND TRANSMIT CONTROL (FIGURE 1-8)

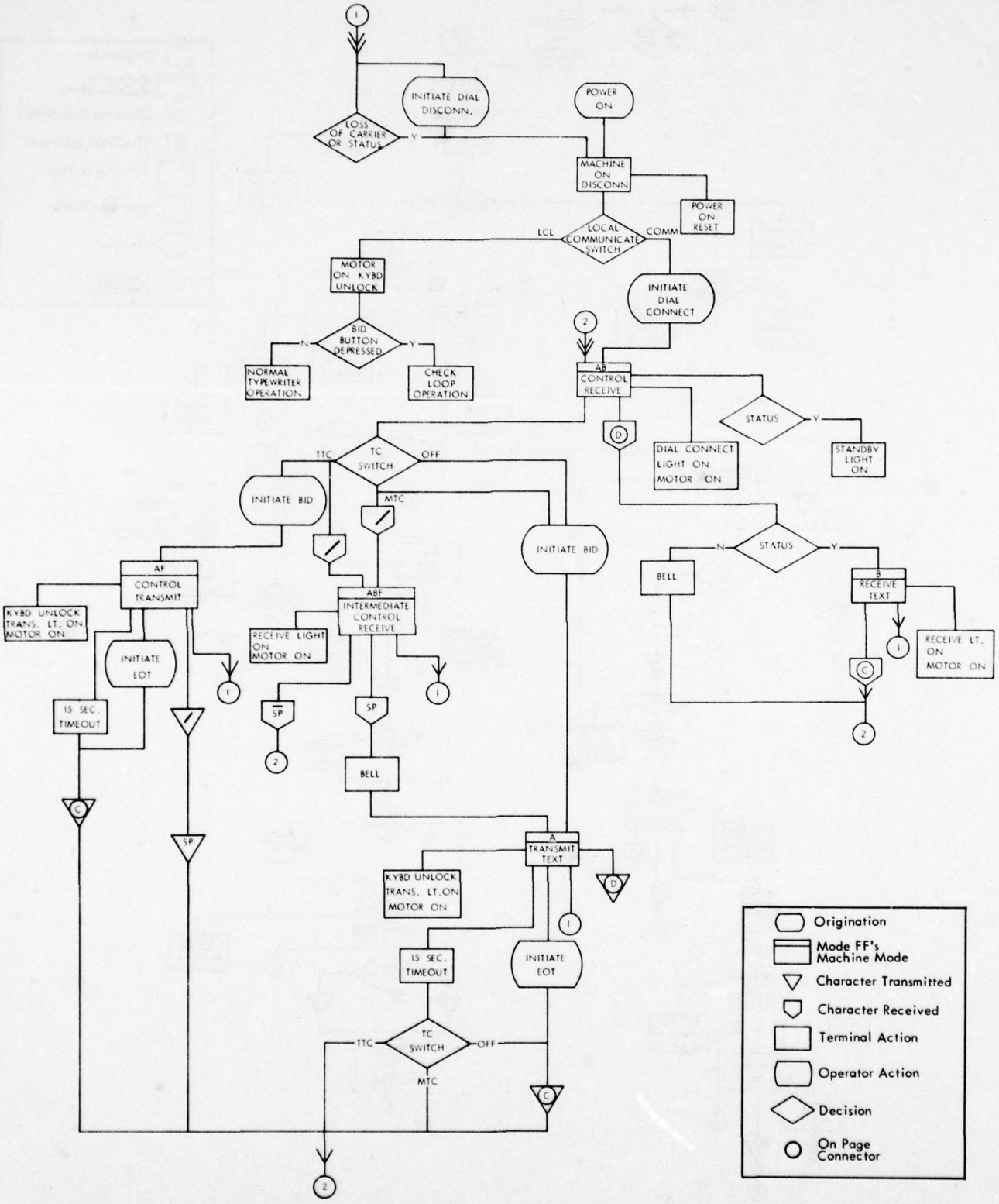


FIGURE 1-8. 2740 WITH DIAL AND TRANSMIT CONTROL

1.5.5 2740 WITH STATION CONTROL (FIGURE 1-9)

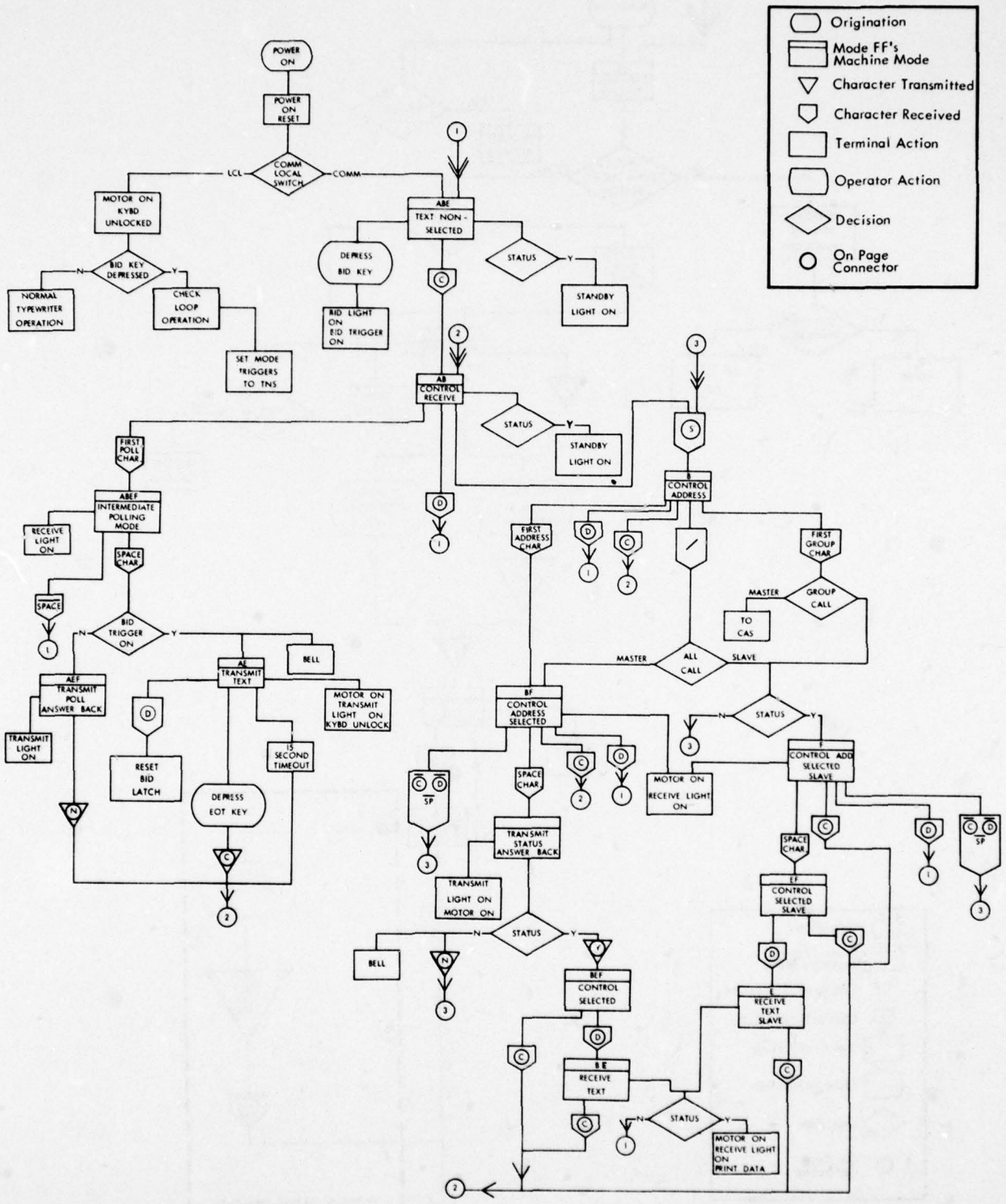


FIGURE 1-9. 2740 WITH STATION CONTROL

1.5.6 2741 WITH INTERRUPT (FIGURE 1-10)

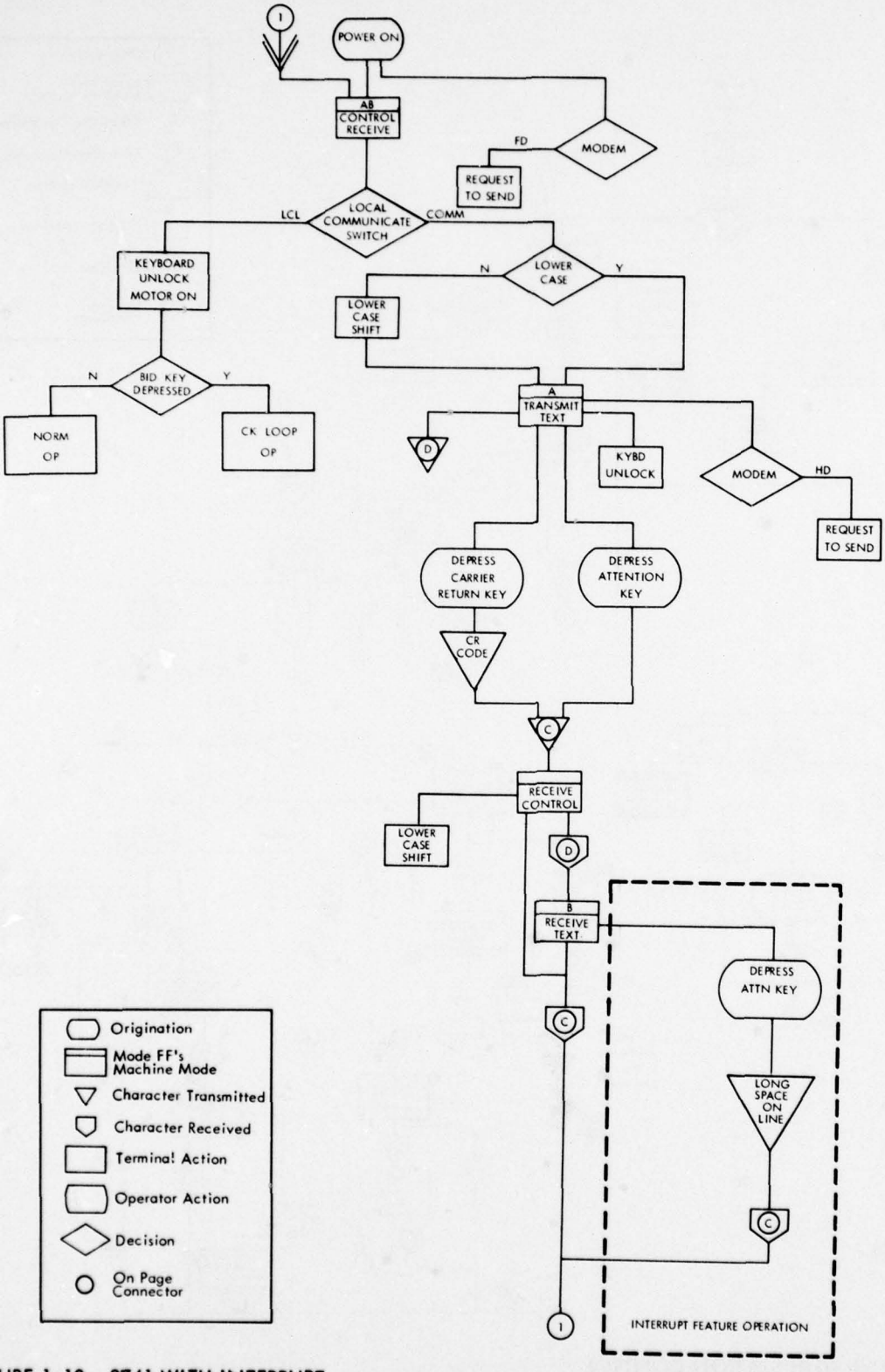


FIGURE 1-10. 2741 WITH INTERRUPT

1.6 CE AID BOX

The CE Aid Box is a pluggable device that can be used on any 2740 or 2741 terminal. The unit plugs into a connector at the top of the SLT gate. There are 14 indicators on the face of the box. Seven of these lights, 1B-1 thru 1B-7, display the condition of the 1B Register latches. ABDEF and L lights indicate the mode of the terminal.

The P light monitors the PE or NOT S-8 circuits. With the 1CH Switch ON, if an error is received, the P light will come ON indicating an error. The P light will turn OFF when the C-chain starts.

By turning the One Cycle Halt (1CH) switch ON, any transmitted or received character can be held in the 1B Register for constant display. To release the character and permit completion of the operation, depress the cycle button on the front of the box. See Figure 1-11 for data flow.

A space generator is built into the CE Aid Box. To operate the space generator the terminal must be forced into a Receive Text Mode. This is done by grounding pin B1E4J12 (A OFF). When the space generator switch is placed in the ON position, spaces will be forced into the ser-des register. Once the space code is in the ser-des register, it will be shifted thru the terminal to the printer and a space function will occur. Space may be single-cycled in by placing the 1CH switch in the ON position and depressing the cycle button.

Table 1-2 shows the wiring connections between the CE Aid Box and the B1 board.

The cards in the CE Aid Box are numbered front to rear 1 thru 4.

It is possible to display an error in the 1B register by grounding A1G4B04. This will generate a 1B set if an error is received. The character will remain in the 1B register if the 1CH switch is ON.

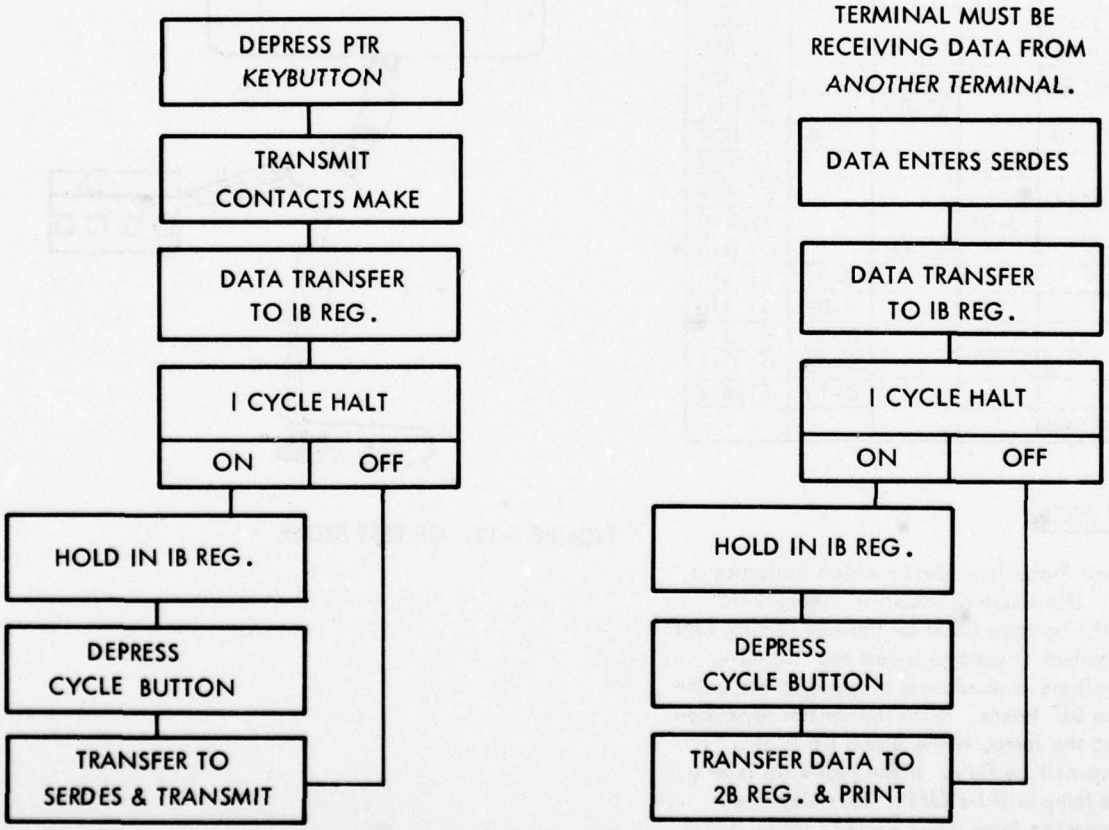


FIGURE 1-11. CE AID BOX DATA FLOW

TABLE 1-2. WIRING CHART (SLT BOARD - CE AID BOX CONNECTOR - CE AID CARDS)

Conn	Card 1	Card 2	Card 3	Card 4	Location B1 Board
A			D-05		E1 B02
B	B-05				D1 B02
C		G-09			E1 D02
D	J-04				D1 D02
E		D-13			E1 B03
F		G-10			D1 B03
H		J-06			E1 D04
J		B-09			D1 D04
K		B-10			E1 B04
L		D-06			D1 B04
M (+12v)	J-08				E1 D05
N	G-02				D1 D05
P	D-09				E1 B05
R	B-02				D1 B05
S (GND)	J-03				E1 D06
T	J-05				D1 D06
U	B-04				E1 B07
V			J-11		D1 B07
W		J-13			E1 D07
X	J-13				D1 D07
Y	J-06				E1 B08
Z	G-09				D1 B08
AA			G-05		E1 D09
BB	G-10				D1 D09
CC		D-02			E1 B09
DD	D-12				D1 B09
EE		J-04			E1 D10
FF			G-08		D1 D10
HH				B-08	E1 B10
JJ				B-02	D1 B10
KK				D-07	E1 D11
LL				D-02	D1 D11
MM				D-10	E1 B12
NN	not used				

1.7 CE TEST PROBE

The CE Test Probe is a device which indicates a voltage level. The probe as shown in Figure 1-12 will indicate the voltage level by the lamp being ON or OFF. The switch is used to invert the incoming signal. The voltage connector is plugged to the voltage pins on the SLT board. With the switch lever positioned toward the lamp, if the probe tip is at a "1" level, the lamp will be ON. If the probe tip is at a "0" level, the lamp will be OFF. Reversing the switch will cause the lamp to be turned ON by a "0" level at the probe tip, and turned OFF by a "1" level.

The probe can also indicate a momentary shift of the voltage level. The probe's logic can recognize a 1 us pulse which will cause the lamp to remain ON for about 45 ms.

If the lamp remains ON with the switch in either position this will indicate a shifting level, such as the clock pulses of the control clock.

The lamp, PN 1132766, can be removed for replacement. Magnets have been molded into the case so the probe can be attached to the electronic gate.

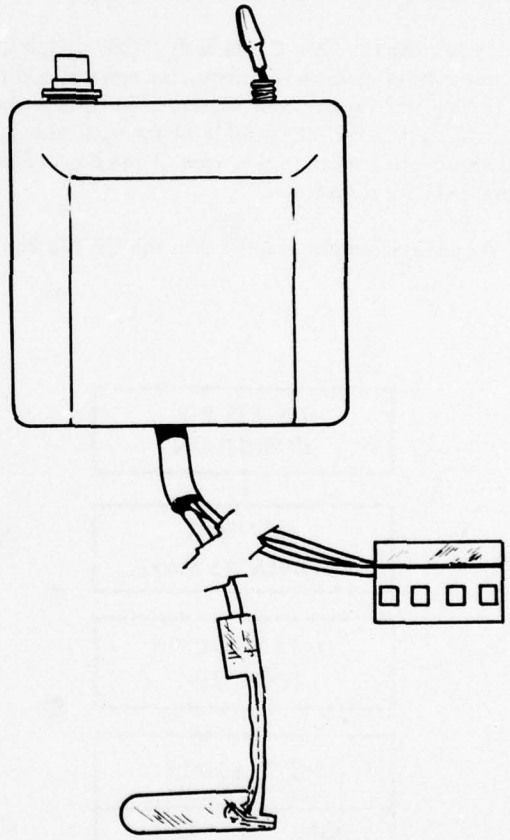


FIGURE 1-12. CE TEST PROBE

SECTION 2. SERVICE AID INDEX

The service aid index for the 835 and 935 printer is covered in the Selectric I/O Printer Service Aids Index.

As Service Aids on the 2740 and 2741 are published an index of these aids will be provided. The index will be distributed to field locations and inserted in this manual immediately following this page.

SECTION 3. SERVICE AIDS

The Service Aids for the 835 and 935 printer are covered in the Selectric I/O Printer Service Aids.

As maintenance experience is gained after 2740 and 2741 installation, new methods and approaches to problems will be discovered. These new ideas will be published as Service Aids and distributed to field locations. They should be inserted in the section immediately following this page. An index of these pages is provided in the previous section.

PRECEDING PAGE BLANK-NOT FILMED

CHAPTER 2

MAINTENANCE FEATURES

SECTION 1. CHECK LOOP

This is a feature which allows a character to be transferred in a normal manner from the printer contacts into the 1B Register. When the character reaches the 1B Register, it is not transmitted but is instead placed in the 2B Register and printed. The primary purpose of this test is to check the I/O, the I/O translator circuits and the magnet drivers. It also checks most areas of the 1B and 2B Registers.

To initiate the check loop the Comm-Local switch is placed in Local and the Bid button is held depressed. Depressing any character or function on the printer, except Shift, will now cause the character to:

1. Type normally.
2. Transfer from the printer contacts to the 1B Register.
3. Be sent back through the 2B Register and be reprinted.

This sequence will be repeated as long as the Bid button is held depressed.

Figure 2-1 shows the Check Loop data flow.

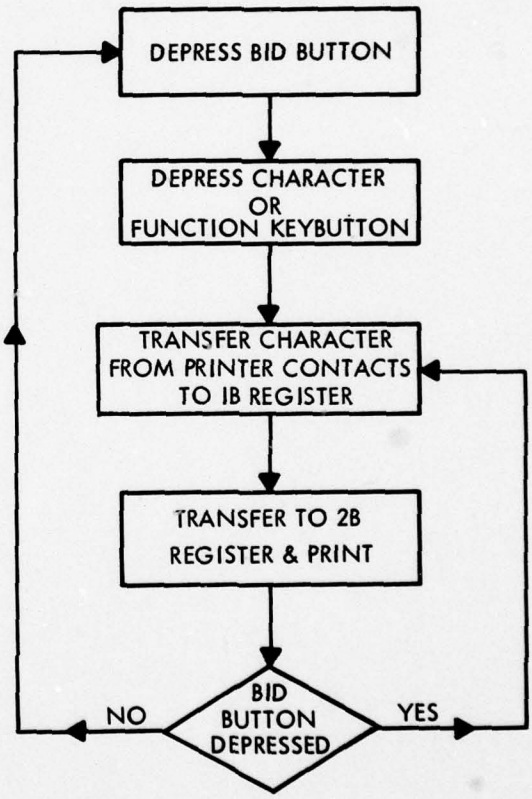


FIGURE 2-1. CHECK LOOP DATA FLOW

SECTION 2. TRANSMIT AND RECEIVE LIGHTS

The 2740 Terminal is designed so the Transmit light will blink OFF and back ON as each character leaves the S-Register. Likewise the Receive light will blink each time a character is received into the S-Register. In Transmit mode, a blinking Transmit light will verify proper operation up to the Data Set Adapter card. A blinking Receive light when information is being received indicates that the information is getting through the Data Set Adapter card and reaching the S-Register input.

CHAPTER 3

PREVENTIVE MAINTENANCE

SECTION 1. MAINTENANCE SCHEDULE

Table 3-1 shows the preventive maintenance schedule.

TABLE 3-1. PREVENTIVE MAINTENANCE SCHEDULE

Routine	Location	Frequency in Months	Check	Observe
1	Power Supply	12	+12V DC	Cables
2	Electronic Gate	12		Air Filter Cables
3	Indicator Lights	4		Operation
4	Control Switches	12	Check for Rust	
5	Basic Printer	4	See Paragraph 3.5 in Section 2	

SECTION 2. MAINTENANCE ROUTINE

3.1 POWER SUPPLY

Check the +12V DC level yearly. If the level is below 11.7V DC the +12V leads should be moved to transformer taps 1 & 5.

3.2 ELECTRONIC GATE

Visually check cables and connectors for any signs of wear or damage. Also check the condition of the air filter.

3.3 INDICATOR LIGHTS

Check for proper operation of indicator lights under all operating conditions.

3.4 CONTROL SWITCHES

Check all control switches to ensure that all switch contacts are clean and operate freely.

3.5 PRINTER

Preventive maintenance on the printer should be performed in accordance with the Universal I/O Keyboard Reference Manual, Form #225-1726.

The following areas are not covered in the Universal I/O Reference Manual. A visual inspection on these items should be performed yearly.

1. Motor Relay
2. Control Switches
3. Control Lamps
4. No-Print Escapement
5. Shift to Print Interlock
6. Paper Status Switch

As a final check after Preventive Maintenance is performed, check loop should be operated with each character. All functions except shift should also be operated with check loop.

CHAPTER 4

CHECKS, ADJUSTMENT AND REMOVAL PROCEDURES

4.1 POWER SUPPLY REMOVAL

When removing the power supply the following procedure can be used:

1. Remove plastic shield.
2. Remove power supply cable from plastic clamp at the top right side of the power supply frame.
3. Remove bottom left mounting screw and loosen right bottom mounting screw.
4. Remove top mounting screws and remove power supply to the left.
5. Caution should be used so as not to damage the TC switch which is located to the top right of the power supply. Once the power supply has been removed it will now sit on the rear of the reading board.

4.2 PRINTER REMOVAL

The following procedure can be used when removing the printer from the terminal desk.

1. Remove power cord from the cable clamp, which is located in the left rear corner of the terminal desk.
2. Disconnect power supply cable from the printer cable.
3. Remove leads from the TC switch and mark for easy replacement.
4. Remove printer cable clamp at the top of the electronic gate.
5. Remove printer cable from the B1 board.
6. Remove printer from the reading board carefully pulling cable thru the terminal desk.
7. If the printer is to be removed from the bottom cover the cable clamp must be loosened.

4.3 PRINTER CHECKS, ADJUSTMENT AND REMOVAL PROCEDURES

The Universal Reference Manual (225-1726) should be used. This manual covers all removal procedures, adjustments and scheduled maintenance of the 835 and 935 printers.

CHAPTER 5

POWER

SECTION 1. VOLTAGES

The 2740 power supply will supply the following DC voltages:

+48 volts 0.25 to 2.0 amps
+12 volts 1.0 to 4.0 amps
-12 volts .1 to .3 amps

2740's with +12V loads up to 1.5 amps will have one 31,000 MFD filter capacitor and a 30 ohm, 10 watt bleeder resistor. When the feature configuration of the 2740 results in a load greater than 1.5 amps on the 12 volt supply, a second 31,000 MFD filter capacitor will be added in place of the bleeder.

The output voltages must be within the following tolerances:

+48, +44.0V to +52.0V
+12, +11.4V to +12.6V
-12, -11.0V to -13.0V

The +12 volt supply has two additional taps available. The output at terminals 1 and 5 will be approximately .3 volt higher than the normal +12V taps. When features are added to the terminal, the 12 volt supply should be checked. If the output of the normal taps becomes 11.7 volts or less, Terminals 1 and 5 should be used.

The relay in the primary of the power transformer is used to provide sequencing.

A 1.5 ohm 2 watt resistor and a zener diode in the +48 supply are used to provide a regulated +12 volts.

SECTION 2. FUSE REQUIREMENTS

5.1 INPUT FUSES

115V 60 CPS, F1, 2.5 amp. slo blo
112.5V & 123.5V 50 CPS, F1, 4.0 amp. slo blo
195V to 235V 50 CPS, F1, 2.0 amp. slo blo

5.2 D.C. SUPPLY FUSES

+48 V supply, F2, 2.0 amp.
+12 V supply, F3, 4.0 amp.
-12 V supply, F4, 0.5 amp.

CHAPTER 6

LOCATIONS

SECTION 1. ELECTRONIC GATE

The SLT gate is located at the rear of the terminal desk. The gate consists of one or two 7 X 13 SLT boards. Each board is capable of accommodating 91 single-position SLT cards, connectors and cable cross-overs. The gate may also have a half board (6 X 6) which may contain 36 single-position SLT cards, connector and cable cross-overs.

Card columns are designated A thru N, excluding I, N being at the hinge side. Card rows are numbered 1 thru 7, from top to bottom. (Figure 6-1)

Pin columns are designated A thru E. Only B and D have pin connections. Pin rows are numbered from 1 to 14. Only rows 2 to 13 are used for circuit connections. Pin columns A and E, and rows 1 and 14 are used for voltage distribution. (Figure 6-2)

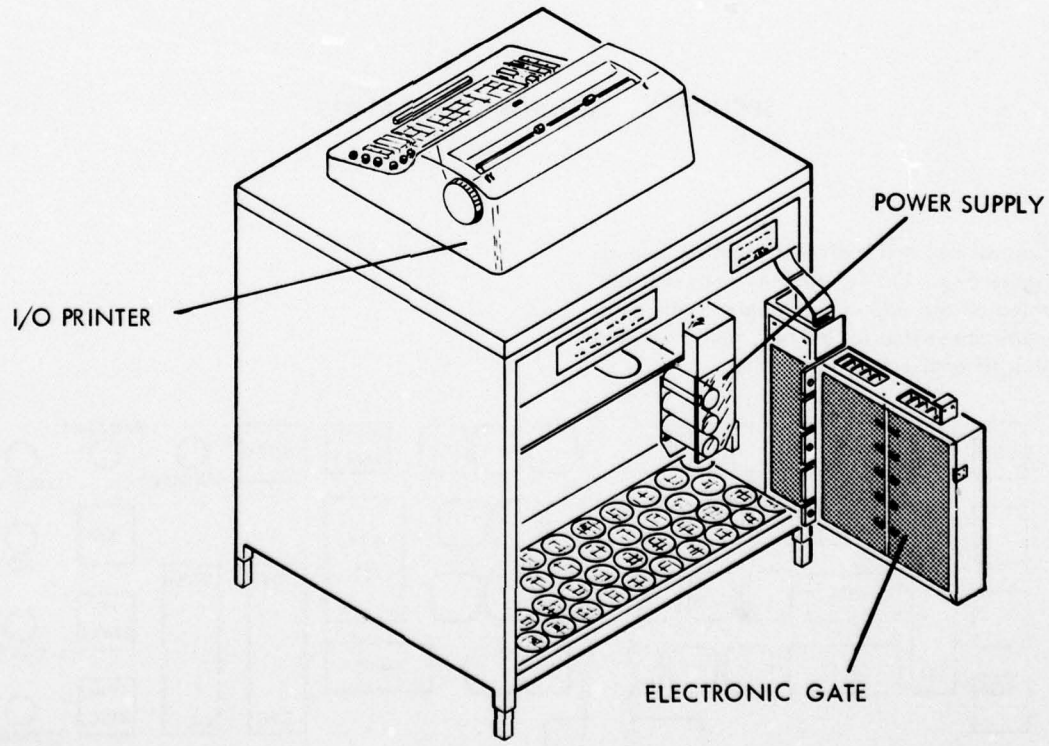


FIGURE 6-1. MAJOR ASSEMBLY LOCATIONS

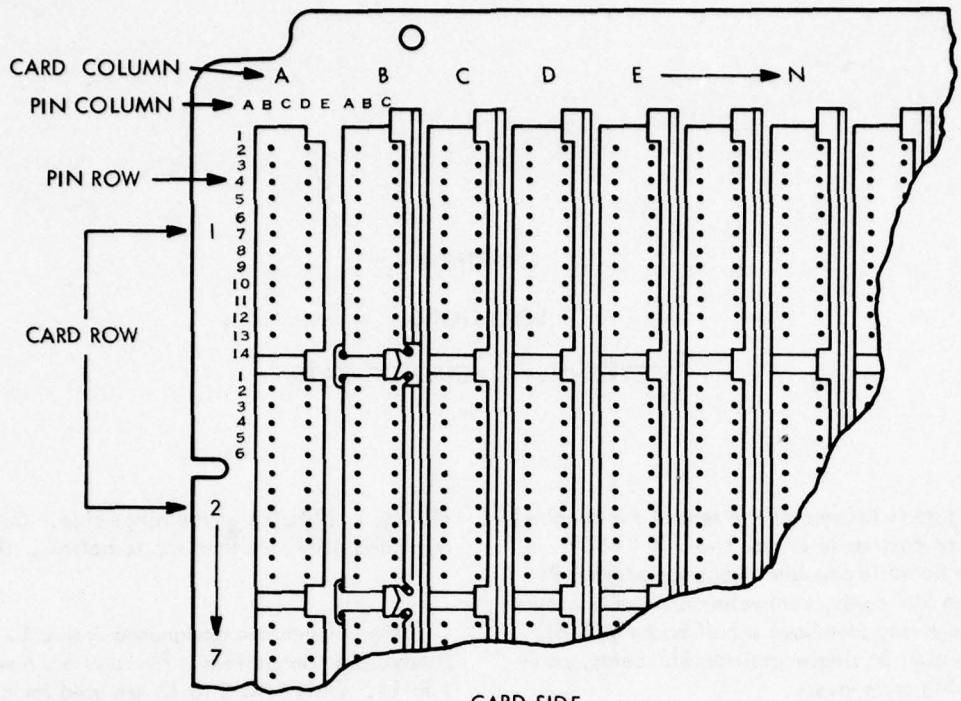


FIGURE 6-2. SLT BOARD PIN LOCATION

SECTION 2. SWITCHES & INDICATORS

2740 Control key and indicator locations are as shown on Figure 6-3. On Figure 6-4, note that the switch mounted on the side of the terminal will be a local-communicate switch for a 2741, and a transmit control switch (if applicable) for a 2740.

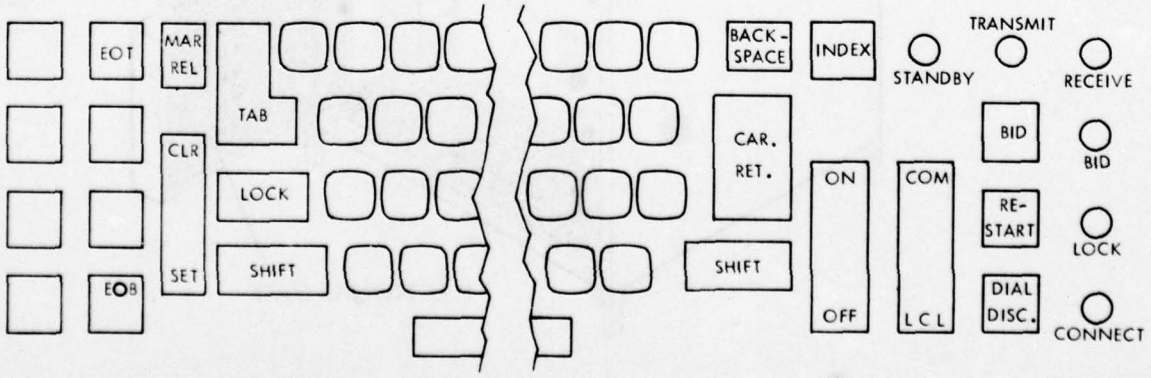


FIGURE 6-3. 2740 CONTROL KEYS & INDICATORS

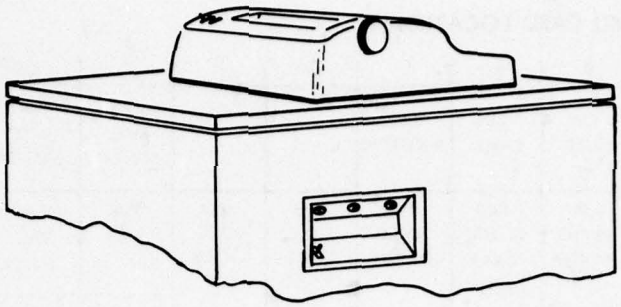


FIGURE 6-4. 2740/2741 SWITCH LOCATION

SECTION 3. CARD LOCATION GUIDE

Tables 6-1 through 6-4 show the card and cable locations for all configurations for the 2740 and 2741 terminals.

TABLE 6-1. 2740 B-1 BOARD CARD LOCATIONS

	A	B	C	D	E	F	G	H	J	K	L	M	N
1	CROSS OVER CABLE			CE CABLE	CE CABLE		3570 S-REG GATES		3569 MAG-DRIVERS	3567 INTE-GRATORS	3567 INTE-GRATORS	PRINTER CABLE	PRINTER CABLE
2	CROSS OVER CABLE	4380 PP FD AND HD DIAL		4370 2B REG PRINTER CASE CKT & PRINTER OP.	4372 ES EOT SDO & STROBE0	4373 2B REG CONTROL	4374 S-REG START CKT BID	4439 S-REG CLOCK CKT	3565 INTE-GRATORS	3569 MAG-DRIVERS	3569 MAG-DRIVERS	PRINTER CABLE	POWER SUPPLY CABLE
3	CROSS OVER CABLE								3569 MAG DRIVERS	3566 INTE-GRATORS	3566 INTE-GRATORS		
4	CROSS OVER CABLE	CROSS OVER CABLE	1325 FOR DIAL 0883 PP FD 0884 CONTEN	4369 1B REG	4371 STATUS STROBE	4441 DOMESTIC	4375 S-REG TRANSMIT	4440 S-REG	4378 IND DRIVERS	3562 DIAL 1263 PP FD 4382 PP HD 6001 OPD D/W HD 6002 OPD D/W FD	3561 COM DSA 0886 IBM MDM DSA 3850 OPD D/W	DATA SET CABLE	
5	CROSS OVER CABLE	CROSS OVER CABLE			MODE CHANGE							CROSS OVER CABLE	
6	CROSS OVER CABLE		4495	4376 KYBD LOCK	4368 1B REG.	0789 POWER UP A1 BOARD	4381 MULTI-VIBRATOR		4377 IOC POR 1B SET				
7	CROSS OVER CABLE									3559 1 SEC TIMER	3744 HOME LOOP		

TABLE 6-2. 2741 B-1 BOARD CARD LOCATIONS

	A	B	C	D	E	F	G	H	J	K	L	M	N
1				CE CABLE	CE CABLE	3849 INTERRUPT			3569 MAG DRIVERS	3567 INTE GRATOR	3567 INTE GRATOR	PRINTER CABLE	PRINTER CABLE
2			1324 LINE CONTROL	4370 2B REG PRINTER CASE CKT & OP	4372 ES EOT SDO & STROBEO	4373 2B REG CONTROL	4374 S-REG START CKT BID	4439 S-REG CLOCK CKT.	3565 INTE GRATOR	3569 MAG DRIVER	3569 MAG DRIVER		POWER SUPPLY CABLE
3									3569 MAG DRIVER	3566 INTE GRATOR	3566 INTE GRATOR		
4			6005 TYPA-MATIC	4369 1B REG	4371 STATUS STROBE MODE CHANGE	4441 DOMESTIC	4375 S-REG TRANSMIT	4440 S-REG	4515 LINE CONTROL	3562 DIAL 1263 PP FD 6001 OPD D/W HD 6002 OPD D/W FD	3561 COM DSA 0886 IBM MODEM DSA 3850 OPD D/W	DATA SET CABLE	
5													
6				4376 KYBD LOCK	4368 1B REG	3570 S-REG GATES	4381 MULT-VIBRATOR		4377 IOC POR 1B SET				
7						3086					3744 HOME LOOP		

TABLE 6-3. 2740/2741 C1 BOARD CARD LOCATIONS

	A	B	C	D	E	F
2						
3						
4	MODEM OUTPUT CABLE				6179 IBM MODEM	
5	DATA SET CABLE	CROSS OVER CABLE				
6		6182 IBM MODEM	6178 IBM MODEM	6180 IBM MODEM	6181 IBM MODEM	
7						

TABLE 6-4. 2740 A-1 BOARD CARD LOCATIONS

	A	B	C	D	E	F	G	H	J	K	L	M	N
1	4503 POWER UP ANY FEATURE	4571 AUTO EOB			4520 TRANSMIT CONTROL	3844 TRANSMIT CONTROL	0791 STATION CONTROL		1321 ANY FEATURE EXCEPT TRANS CTL	1278			CROSS OVER CABLE
2						1266 STATION CONTROL	4384 STATION CONTROL	1326 CHECKING VRC			1328 CHECKING VRC	4386 TRANSMIT CONTROL	CROSS OVER CABLE
3			4502 CHECKING VRC						1319 CHECKING VRC	3745 CHECKING LRC			CROSS OVER CABLE
4				0796 ANY FEATURE		4496 STATION CONTROL	4387 CHECKING VRC			1265 CHECKING VRC	4500 CHECKING LRC	CROSS OVER CABLE	CROSS OVER CABLE
5			4501 CHECKING VRC					3846 MODEM	3743 ANY FEATURE EXCEPT TRANSMIT CONTROL			CROSS OVER CABLE	CROSS OVER CABLE
6						4497 STATION CONTROL	4385 STATION CONTROL			1264 STATION CONTROL	1322 TRANSMIT CONTROL		CROSS OVER CABLE
7									0795 ANY FEATURE EXCEPT TRANSMIT CONTROL				CROSS OVER CABLE

APPENDIX A

FIELD ENGINEERING REFERENCE MATERIAL

A.1 FLIP-FLOP, LATCH AND TRIGGER DESCRIPTIONS

A-MODE Flip-Flop AA211

Purpose: Combines with other mode flip-flops to control mode of terminal operation.

Gate on: A ON

Gate off: A OFF

Set on: CC1

Set off: CC1

AEOB Flip-Flop BB391

Purpose: Will cause an automatic EOB after a carrier return operation.

Gate on: AEOB SET GATE

Gate off: 1. TT2, AEOB, CRC, C2

2. TT2, NOT FCR, (MC)

Set on: CC1

Set off: CC1

B-MODE Flip-Flop AA211

Purpose: Combines with other mode flip-flops to control mode of terminal operation.

Gate on: B ON

Gate off: B OFF

Set on: CC1

Set off: CC1

BID Flip-Flop AA131

Purpose: Causes terminal to enter Transmit Text and send BID character, or sets latch to contend for line.

Gate on: SET BID

Gate off: RESET BID

Set on: CC2

Set off: CC2

C1 Flip-Flop AA071

Purpose: With C2, controls 1B Register data flow

Gate on: C1G

Gate off: NOT C2

Set on: CC1

Set off: CC1

C2 Flip-Flop AA071

Purpose: With C1, controls 1B Register data flow.

Gate on: NOT C1

Gate off: C1

Set on: CC2

Set off: CC1

COMM-LOC Flip-Flop AA201

Purpose: Determines whether the terminal is in a Communicate or Local mode of operation.

Gate on: SET LOC

Gate off	RESET LOC
Set on	CC2
Set off	CC2

D-MODE Flip-Flop BB011

Purpose	Combines with other mode flip-flops to determine terminal operation.
Gate on	D ON
Gate off	D OFF
Set on	CC1
Set off	CC1

DIAL DISC (NOT) Latch AA301

Purpose	Provides for a disconnect from a dial connection.
Turn on	NOT POR, DSR
Turn off	NOT CLR, DIAL DISC N/O

E-MODE Flip-Flop BB091

Purpose	Combines with other mode flip-flops to determine terminal operation.
Gate on	E ON
Gate off	E OFF
Set on	CC1
Set off	CC1

EOB Flip-Flop BB041

Purpose	Create an end of block check character.
Gate on	EOB GATE
Gate off	1. NOT EOT 2. NOT ES
Set on	CC2
Set off	CC2

EOS LATCH AA321

Purpose	Delays a mode change on EOB and EOT.
Turn on	CIRCLE C, SEND, C1, NOT C2, (ES)
Turn off	NOT MC

EOT Flip-Flop AA101

Purpose	Sends an EOT character and causes terminal to return to Control Receive mode.
Gate on	EOT GATE
Gate off	SRE, O
Set on	CC2
Set off	CC2

ERL (Latch) BB021

Purpose	Remembers an error and conditions NOT 2B1.
Turn on	1. 2BOR 2. RT, NOT L, PE OR NOT S8 3. RT, IC
Turn off	1. RCS 2. D, (ES), C2 3. NOT (A)

ES Flip-Flop AA101

Purpose	Enters information into the Ser-Des register in a transmit mode of operation.

Gate on NOT ES GATE

Gate off ES RESET GATE

Set on SDAC

Set off CC1

ES GATE Flip-Flop AA131

Purpose Used to gate the ES flip-flop.

Gate on
1. NOT SEND, NOT LINE, S0
2. SEND, NOT STROBEO, 1BF, SRE, CLS

Gate off
1. NOT CLR, NOT C1, NOT C2
2. C2, NOT 2B SET, NOT SEND
3. SEND

Set on SDCAC2

Set off CC2

F-MODE Flip-Flop BB061

Purpose Combines with other mode flip-flops to control mode of terminal operation.

Gate on F ON

Gate off F OFF

Set on CC1

Set off CC1

FCR Latch BB391

Purpose Used to force a carrier return operation.

Turn on RAB, 2B SET

Turn off NOT CRC, AEOB

GARBLE Flip-Flop BB101

Purpose Prevents entering information into the 1B Register until the Ser-Des has had enough time to synchronize with the line.

Gate on
1. *NOT POR
2. NOT REPEAT

Gate off
1. SEND
2. TO15, NOT C1, NOT C2

Set on CC1, CC2

Set off CC1, CC2

ILC Latch AA261

Purpose Ensures that the printer will be in lower case before any information is received or sent.

Turn on TNS OR CR

Turn off UC1

IOC (NOT) Latch AA141

Purpose Tells the electronics when the printer is ready to accept another operation.

Turn on IOR N/O

Turn off IOR N/C

L-MODE Flip-Flop BB181

Purpose Defines the check mode of terminal operation.

Gate on
1. TNS OR CR, (A), (B), NOT C1, *CIRCLE B
2. RT, NOT C1, *CIRCLE B
3. EOS AND NOT O, *TT, *CIRCLE B

Gate off L OFF

Set on CC1

Set off CC1

L-1 thru L-7 Flip-Flops BB141-161

Purpose LRC Register flip-flops.

Gate on The L#-AC set on pulse

Gate off The NOT L side of the flip-flop

Set on L#-AC

Set off L#-AC

MC Flip-Flop AA211

Purpose Indicates a change of mode in terminal operation.

Gate on MC-A

Gate off NOT MC

Set on CC1

Set off CC1

O Flip-Flop AA141

Purpose Indicates when the printer is operating.

Gate on
1. NOT QUAN STROBE 2, NOT SEND
2. NOT IOR, NOT SEND
3. *NOT 2B SET, SRE, 2BE, HALT, NOT 2BSSG

Gate off
1. SD3, SD2, NOT SD1, SEND
2. NOT SEND

Set on CC2

Set off CC2

PE Flip-Flop BB021

Purpose Used to bring up PE OR NOT S8 to indicate a parity error.

Gate on S8, NOT PE, NOT (SEND)

Gate off S8, PE, NOT (SEND)

Set on SDAC

Set off SDAC

PE OR NOT S8 Latch BB021

Purpose Indicates that a parity error has been received.

Turn on
1. NOT GARBLE, NOT (SEND), *NOT 2B SET, PE, NOT (S0), C1, C2
2. NOT (S0), NOT GARBLE, NOT (SEND), *NOT 2B SET, NOT S8, C1, C2

Turn off 1BR

RE-LR Flip-Flop BB181

Purpose Used to reset the LRC Register.

Gate on *NOT POR

Gate off (MC), NOT L

Set on CC1

Set off CC2

REPEAT Flip-Flop AA371

Purpose Used to operate the "home loop".

Gate on RSG

Gate off RRG

Set on CC2

Set off CC1

REST Flip-Flop BB321

Purpose	Enables a restart operation when a negative answer back has the printer keyboard locked.
Gate on	REST SET
Gate off	1. NOT EOT 2. REST RESET
Set on	CC2
Set off	CC2

SD-1 thru 4 Flip-Flops AA061-071

Purpose	Ser-Des clock flip-flops used to generate SDAC.
Turn on	CLR
Turn off	NOT CLR

SRE Flip-Flop AA131

Purpose	Indicates an empty Ser-Des Register.
Gate on	SRE SET GATE
Gate off	NOT ES GATE
Set on	SDCAC2
Set off	SDAC

SET LR Flip-Flop BB181

Purpose	Used to set the LRC Register.
Gate on	1. (ES), TO1, *TT, C1 2. RT, *NOT 2B SET, C1 3. (ES), NOT CIRCLE D, *TT, C1
Gate off	NOT SET LR
Set on	CC2
Set off	CC1

ST Flip-Flop AA201

Purpose	Indicates the terminal's status.
Gate on	STS
Gate off	ST-R
Set on	CC2
Set off	CC2

STROBE Flip-Flop AA201

Purpose	Transfers printer information to the 1B Register.
Gate on	NOT STROBEO
Gate off	STROBEO
Set on	CC2
Set off	CC2

STROBEO Flip-Flop AA101

Purpose	Used to gate the STROBE flip-flop.
Gate on	STROBEO SET GATE
Gate off	NOT QUAN STROBE 2
Set on	CC1
Set off	CC1

S-0 thru 8 Triggers AA021-041

Purpose	Ser-Des Register triggers used to change serial information to parallel and vice versa.
Turn on	Lack of information bit
Turn off	Information bit
Set on	SDAC
Set off	SDAC

TO1 Latch AA271

Purpose: One second timer to allow time for the printer motor to reach operating speed.

Turn on: TO1-A

Turn off: Timer circuit

TO15 Latch AA311

Purpose: Fifteen second timer for terminal timeout, and garble protection.

Turn on: SEND, NOT STROBEO, NOT 1BG, NOT O, 1BE

Turn off: Timer circuit

1B-1 thru 7 Latches AA181-191

Purpose: 1B Register latches used to accept information from the S-Register, the IO contacts, or terminal electronics.

Turn on:
1. *STROBE (entry from printer)
2. 1BG (entry from terminal electronics)
3. 1B SET (entry from Ser-Des or terminal electronics)

Turn off: 1BR

2B-1 thru 7 Latches AA081-091

Purpose: 2B Register latches used to buffer information between the 1B Register and the printer.

Turn on: 2B SET

Turn off: 2B RESET

2B SET Flip-Flop AA121

Purpose: Used to set information into the 2B Register.

Gate on: NOT 2BSSG

Gate off: NOT 2B SET

Set on: CC2

Set off: CC2

2BR Flip-Flop AA121

Purpose: Used to gate 2B RESET GATE.

Gate on: 2BRG

Gate off: NOT 2BR

Set on: CC2

Set off: CC2

2B RESET GATE Flip-Flop AA121

Purpose: Used to gate 2B RESET

Gate on:
1. 2BOR, 2BR
2. 2BR, IOC

Gate off: NOT IOC

Set on: CC1

Set off: CC1

2ND Flip-Flop BB301

Purpose: Forces the terminal to mode change to Control Receive.

Gate on: CTA, NOT STROBEO, *STROBE

Gate off: NOT (MC)

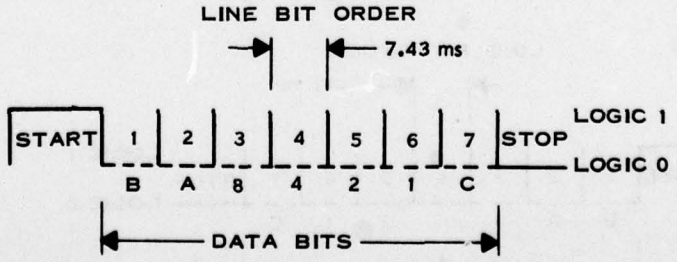
Set on: CC2

Set off: CC2

A.2 2740 CODE CHART (TABLE A-1)

TABLE A-1. 2740 CODE CONVERSION - BCD HEAD

R2A	R2	R1	R-5	3 4 5 6 / 8 4 2 1	LOWER CASE T Ø T1 T2 T3	UPPER CASE T Ø T1 T2 T3
				HEAD CODE	T2 T1 T2 T1 T2 T1 T2 T1	T2 T1 T2 T1 T2 T1 T2 T1
				MAGNETS PICKED	1 1 1 0 0 1 0 0	1 1 1 0 0 1 0 0
				LINE CODE BIT ORDER	1 2 1 2 1 2 1 2	1 2 1 2 1 2 1 2
					B A B A B A B A	B A B A B A B A
					0 0 0 1 1 0 1 1	0 0 0 1 1 0 1 1
0	0	0	0	0 0 0 0	SP @ (N) &	SP ° — +
1	1	1	1			
0	0	0	1	0 0 0 1	1 / j a	= ? J A
1	1	1	1			
0	0	1	0	0 0 1 0	2 s k b	ç S K B
1	1	0	0			
0	0	1	1	0 0 1 1	3 t l c	; T L C
1	1	0	1			
0	1	0	0	0 1 0 0	4 u m d	: U M D
1	0	1	0			
0	1	0	1	0 1 0 1	5 v n e	% V N E
1	0	1	1			
0	1	1	0	0 1 1 0	6 w o f	' W O F
1	0	0	0			
0	1	1	1	0 1 1 1	7 x p g	" X P G
1	0	0	1			
1	0	0	0	1 0 0 0	8 y q h	* Y Q H
0	1	1	1			
1	0	0	1	1 0 0 1	9 z r i	(Z R I
0	1	1	0			
1	0	1	0	1 0 1 0	0	)
0	1	1	1			
1	0	1	1	1 0 1 1	# (D) , (S) $ (Y) .	+ − , ! .
0	1	0	0			
1	1	0	0	1 1 0 0		
0	0	1	1			
1	1	0	1	1 1 0 1	INDEX CR/LF TAB	INDEX CR/LF TAB
0	0	1	0			
1	1	1	0	1 1 1 0	UC SHIFT (B) EOB BKSP LC SHIFT	UC SHIFT (B) EOB BKSP LC SHIFT
0	0	0	1			
1	1	1	1	1 1 1 1	(C) EOT IDLE	(C) EOT IDLE
0	0	0	0			

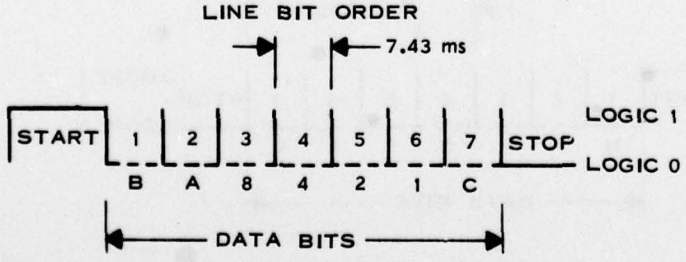


A.3 2741 CODE CHART (TABLE A-2)

TABLE A-2. 2741 CODE CONVERSION - CORRESPONDENCE HEAD

R2A	R2	R1	R-5	3 4 5 6 / 8 4 2 1	LOWER CASE T0	LOWER CASE T1	LOWER CASE T2	LOWER CASE T3	UPPER CASE T0	UPPER CASE T1	UPPER CASE T2	UPPER CASE T3
					T2 T1 / 1 2 / B A / 0 0	T2 T1 / 1 2 / B A / 0 1	T2 T1 / 1 2 / B A / 1 0	T2 T1 / 1 2 / B A / 1 1	T2 T1 / 1 2 / B A / 0 0	T2 T1 / 1 2 / B A / 0 1	T2 T1 / 1 2 / B A / 1 0	T2 T1 / 1 2 / B A / 1 1
0	0	0	0	0 0 0 0	SP	t	!	j	SP	T	0	J
0	0	0	1	0 0 0 1	] / 1	x	m	g	[/ ±	X	M	G
0	0	1	0	0 0 1 0	2	n	.	=	@	N	.	+
0	0	1	1	0 0 1 1	3	u	v	f	#	U	V	F
0	1	0	0	0 1 0 0	5	e	'	p	%	E	"	P
0	1	0	1	0 1 0 1	7	d	r	;	&	D	R	:
0	1	1	0	0 1 1 0	6	k	i	q	¢	K	I	Q
0	1	1	1	0 1 1 1	8	c	a	,	*	C	A	,
1	0	0	0	1 0 0 0	4	l	o	/	$	L	O	?
1	0	0	1	1 0 0 1	0	h	s	y	)	H	S	Y
1	0	1	0	1 0 1 0	z				Z			
1	0	1	1	1 0 1 1	9 (D)	b	w	—	(	B	W	___
1	1	0	0	1 1 0 0								
1	1	0	1	1 1 0 1		ATTN	CR / LF	TAB		ATTN	CR / LF	TAB
1	1	1	0	1 1 1 0	UC SHIFT		BKSP	LC SHIFT	UC SHIFT		BKSP	LC SHIFT
1	1	1	1	1 1 1 1	(C) EOT		IDLE		(C) EOT		IDLE	

HEAD CODE
MAGNETS PICKED
LINE CODE BIT ORDER



A.4 MODE CHART (TABLE A-3)

TABLE A-3. MODE CHART

MODE TRIGGERS D E F	A 1 B 1	1 0	0 0	0 1
0 0 0	CONTROL RECEIVE			CONTROL ADDRESS
0 0 1	TRANSMIT STATUS A/B		CONTROL ADDRESS SELECTED SLAVE	CONTROL ADDRESS SELECTED
0 1 1	INTERMEDIATE CTRL RCV / INTERMEDIATE PULL MODE	CONTROL TRANSMIT / TRANSMIT PULL A/B	CONTROL SELECTED SLAVE	CONTROL SELECTED
0 1 0	TEXT NON-SELECTED	TRANSMIT TEXT	RECEIVE TEXT SLAVE	RECEIVE TEXT / L-RLRC
1 1 0		RECEIVE CHECK A/B / L - TLRC	RECEIVE CHECK SLAVE	TRANSMIT A/B
1 1 1		TRANSMIT TEXT LOCK		

A.5 LINE ADAPTERS AND DATA SETS

A.5.1 LINE ADAPTERS AND DATA SETS

1. Limited distance line adapters
   Type 1 up to 4.75 miles 135 baud
   2 wire HD 4 wire FD
   Type 2A up to 8.25 miles 135 baud
   2 wire HD SMS only
   Type 2B up to 8.25 miles 600 baud
   2 wire HD SMS or SLT

2. Leased line adapters
   Type 1A 2 wire HD 600 baud
   Type 1B 4 wire HD or FD 600 baud

3. Shared line adapters
   Type 1A 2 wire HD 135 baud
   Type 1B 4 wire HD or FD 135 baud

4. Western Electric 103A Data Set or equivalent.

5. Western Electric 103F Data Set or equivalent.

6. Western Union 11725A Data Set or equivalent.

7. Western Union 1601A Data Set or equivalent.

A.5.2 LINES

1. Customer-owned in-plant lines.

2. Common-carrier leased, private-line telephone service. The lines are owned and maintained by a communications company but are used only by the customer.

3. Common dial lines. These are normal switched telephone lines and are available to any telephone user on a dial-up basis. The data set associated with each terminal will be assigned a telephone number. The operator must dial the telephone number of the other terminal to make a connection.

A.5.3 DATA SET SPECIFICATIONS

103A & 103F

Power Requirement

115 VAC, 60 CPS, less than 15 watts

Temperature and Humidity

40 degrees to 120 degrees Fahrenheit
20% to 95% relative humidity

Transmission Speeds

103A - up to 200 bits per second
103F - up to 300 bits per second

A.5.4 DATA SET CIRCUITS

BA - Transmitted Data. The terminal presents data to the data set at this circuit. This circuit is operative only when CA (Request to Send) and CB (Clear to Send) are ON.

BB - Received Data. Delivers data from data set to terminal. When data set is idle this circuit is held in a Mark condition.

CA - Request to Send (103F only). This circuit allows the terminal to turn carrier OFF and ON.

CB - Clear to Send. This circuit is used to indicate that a connection has been established with another data set.

CC - Data Set Ready. Indicates that the data set is ON and ready to transmit or receive data.

CD - Data Terminal Ready (103A only). Turned ON to put the data set in a data mode, either automatically or manually.

CE - Ringing Indicator (103A only). Indicates a ring signal is being received by the data set.

CF - Carrier Detector. Same signal as CB (Clear to Send).

CX - Local Mode. The signal is not used with a 103A data set. The signal is grounded when a 103F data set is used.

CY - Originate Mode. Controls answer and originate modes if data set is not permanently strapped in either mode.

A.5.5 DATA SET INTERFACE - 103A (TABLE A-4)

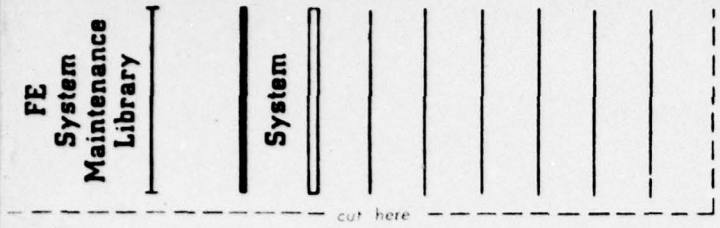
TABLE A-4 DATA SET INTERFACE - 103A

SIGNAL	NAME	DATA SET CONN. PIN	2740/2741 GATE LOCATION	DIRECTION OF SIGNAL
				DATA SET ✕ TERM
AA	PROTECTIVE GROUND	1	———	
AB	SIGNAL GROUND	7	GROUNDED AT CABLE	✕
BA	TRANSMITTED DATA	2	B1 M4 B13	←
BB	RECEIVED DATA	3	B1 M4 B12	→
CB	CLEAR TO SEND	5	B1 M4 B07	→
CC	DATA SET READY	6	B1 M4 D13	→
CD	DATA TERM. READY	20	B1 M4 D08	←
CE	RINGING INDICATOR	22	NOT USED	✕
CF	CARRIER DETECTOR	8	NOT USED	→

A.5.6 DATA SET INTERFACE - 103F (TABLE A-5)

TABLE A-5 DATA SET INTERFACE - 103F

SIGNAL	NAME	DATA SET CONN. PIN	2740/2741 GATE LOCATION	DIRECTION OF SIGNAL
				DATA SET / TERM
AA	PROTECTIVE GROUND	1	———	
AB	SIGNAL GROUND	7	GROUNDED AT CABLE	✕
BA	TRANSMITTED DATA	2	B1 M4 B13	←
BB	RECEIVED DATA	3	B1 M4 B12	→
CA	REQUEST TO SEND	4	B1 M4 B10	←
CB	CLEAR TO SEND	5	B1 M4 B07	→
CC	DATA SET READY	6	B1 M4 D13	→
CF	DATA CARRIER DETECTOR	8	B1 M4 B09	→
CX	LOCAL MODE	12	B1 M4 D12	→
CY	ORIGINATE MODE	11	B1 M4 D10	✕



229-9504-0

IBM 2740/2741 Printed in U.S.A. 229-9504-0

IBM

International Business Machines Corporation

Data Processing Division

112 East Post Road, White Plains, N. Y. 10601